University of Alberta

Participant Interaction and Discourse Practice in an Asynchronous Learning Environment

by

Judith P. Blanchette ©

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The real act of discovery consists not in finding new lands but in seeing with new eyes.

- Marcel Proust

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The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research for acceptance, a thesis entitled Participant Interaction and Discourse Practice in an Asynchronous Learning Environment submitted by Judith P. Blanchette in partial fulfillment of the requirements for the degree of Doctor of Philosophy in Administration of Postsecondary Education.

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Abstract

This study examined the communicative strategies used by participants in an asynchronous post-secondary learning environment. A multiple perspective approach (Green & Harker, 1988) was used to examine the manifold facets of this interaction. Conceptual frameworks and research methods were drawn from the fields of asynchronous communication, sociolinguistics, and social cognition. While the research was structured around elements of language, it also encompassed theories of cognitive functions and teaching and learning. Research methods included software, surface, and lexical interaction analysis; speech act and discourse analysis; and elements of content and social network analysis.

In this three-part study, archived transcripts of messages posted by participants in a graduate program were analysed to determine the extent and nature of their on-line interaction. Participants used lexical connections to a greater extent than surface or software linkages to maintain cohesive discussions. Participants self-regulated the duration of their interaction, and group size was a factor in the rate of participation. Three analytical methods were compared; their ability to detect specific characteristics of online interaction was evaluated.

Speech act theory (Sinclair & Coulthard, 1983) provided the conceptual framework used to determine if there exists an on-line variant of teacher talk and learner talk. Identification of speech acts and moves revealed substantive differences in the organisational, interactive, and content-related features of both teacher's and learners' contributions. Some speech acts and moves were unique to

the asynchronous context. Stenström's (1994) hierarchical system of conversation structure was not representative of on-line interaction; a new model of the underlying structure of asynchronous interaction is presented.

Finally, the syntactic structure, cognitive functions, pedagogical features and communicative characteristics of participants' questions were examined. They used fewer syntactic forms than observed in face-to-face post-secondary classrooms but, based on Gallagher & Aschner' (1963) Model of Productive Thinking, they exhibited higher levels of cognition. Questions at higher cognitive levels were found to stimulate more interaction than did those at lower levels. Compared with face-to-face interaction, students asked more rhetorical questions, using them to persuade, think aloud, and indirectly challenge other participants.

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Introduction

Within the realm of adult distance education, the introduction of communication technologies has added a new dimension to the learning environment. Text-based asynchronous communication has allowed participants to interact more easily, both with the instructor and with other learners. At the same time, however, these technologies have acted as a catalyst for participants to adapt conventional communication strategies. This has led to a situation where we must re-examine our assumptions about the way participants communicate within an educational context, and even question how they learn within that environment. To that end, this study draws on several domains and concepts in an attempt to address the questions:

1. What is the extent of participant interaction within an on-line post-secondary learning environment?
2. What are the specific characteristics of this interaction?

These questions are answered in the paper *Participation and interaction: Maintaining cohesion in asynchronous discourse,* the first of three papers that form the body of this dissertation.

3. What are the qualitative and quantitative characteristics of the organisational, interactive, and content-related features of the instructor's contributions?

4. What are the qualitative and quantitative features of the organisational, interactive, and content-related characteristics of the learner's contributions?

These questions are the focus of the paper *Characteristics of teacher talk and learner talk in the on-line learning environment.*

5. What syntactic form do these contributions take?
6. How do questions asked within this context differ from those observed in face-to-face interaction?

These questions are addressed in the paper *Questions in the on-line learning environment.*

Review of the Literature

This study draws on research in the domains of social learning theory, sociolinguistics, and computer-mediated communication. More specifically, the concepts addressed will build on research on higher level cognitive functioning in on-line interaction; the use of language by participants in the on-line learning environment ("teacher talk" and "learner talk") from a discourse analysis perspective; and asynchronous text-based interaction (computer conferencing) in a post-secondary context.

cognition. The former position reflects the work of Piaget where the focus is on individual cognition. In this view, the only function of the group is to provide social pressure to solve problems, which stimulates the individual to resolve internal conflicts which, in turn, leads to cognitive growth. The latter position is based on the Vygotskian model, wherein the group plays an integral rather than peripheral role in cognitive growth. Knowledge is created through social interaction, and then, primarily through language (Frawley, 1997). Young (1997) illustrates the full continuum of epistemological stances relating to how humans create knowledge, the relationship between the individual and social context, and their relative impact on the process of knowledge creation. He identifies six schools of thought, each of which can be placed in one of three categories:

- Category 1, in which social context and interaction are irrelevant:
    1. Radical, Material constructivism, and
    2. Critical, Final constructivism;
- Category 2, in which the social environment may or may not play a role in the construction of knowledge:
    3. Existential constructivism, and
    4. Efficient, Objective constructivism;
- Category 3, in which the social nature of knowledge construction is central:
    5. Social, Formal constructivism, and
    6. Co-constructivism.

Just as research in social cognition in general has burgeoned over the last two decades, so has the research in the area of learning as a social process. These studies take diverse approaches to address such issues as learner perceptions, instructional methods, cognitive achievement, and student evaluation. The research indicates that cooperative learning can be more effective than interpersonal, competitive and individualistic efforts in promoting cognitive development, self-esteem, and positive student-student relationships (Johnson, 1981).

Since then, a number of other researchers have reached the same conclusions. Tinto, Goodsell-Love and Russo (1993) investigated the impact of social learning on student perseverance and concluded that students who were members of "learning communities" were both more positive about their involvement and more engaged with their learning than those who were not part of such communities. In addition to developing friendships, students developed greater respect for alternate views that in turn helped them to make intellectual connections, appreciate complexity and engage more deeply (Gabelnick, MacGregor, Matthews & Smith, 1990). A 1991 study (Menges, Weimer & Assoc.) also reports increased confidence as well as higher academic achievement in those students participating in collaborative learning activities.

With regards to cognitive achievement, Gokhale (1995) notes the body of evidence related to higher levels of thinking skills and greater retention among students who engage in the active exchange of ideas when compared with those

who learned individually. His own research confirms that while there is no difference in achievement on tests of factual knowledge, students in the collaborative work groups performed significantly better on tests of higher order thinking skills such as synthesis, analysis and evaluation than did students who studied individually. Johnson and Johnson (1994) have provided one of the most comprehensive reviews of the research on cooperative learning at the college level. This meta-analysis addressed research on achievement levels, student retention, and community building. They were also interested in studies that investigated the relationship between co-operation, competition, and psychological health.

Sociolinguistics and Discourse Analysis in Education

If one subscribes to the Vygotskian view (Bruner, 1985) that human beings are social learners, and that language is the tool that enables us to create knowledge, it follows that studying the way language is used in the classroom should help reveal how knowledge is constructed in that environment. There is more than one view of the functions and structure of language. One perspective, that of formal linguistics and linguistic philosophy, is that language serves a transactional function. That is, language is oriented towards content and serves to transmit factual information. A second perspective, that language serves an interactional function, forms the foundation of social linguistics. This view takes into consideration the *phatic* use of language—the way language is used to maintain social relations, express personal attitudes, share viewpoints, and

negotiate meaning. The latter perspective includes both descriptive linguistics which describes how language is used to communicate, and sociolinguistics which studies the structure of social interaction, conversation and social context, that is, "real" language in use (Brown & Yule, 1983; Stubbs, 1984).

Language can be studied at a number of levels. Lexical analysis is a word level analysis. Syntactic analysis is conducted at the level of the sentence or utterance. Discourse analysis studies language at the conversational level (Brown & Yule, 1983; Schiffrin, 1994). Generally speaking, a sentence is considered to be written and an utterance spoken, while a conversation is defined as a set of linguistic units that are larger than a sentence or utterance and involve more than one person (Schiffrin, 1994).

The last two types of analysis, syntactic and discourse, can be further categorized according to whether the text is considered to be an object, a product, or a process. Some linguists take the position, typified by Chomsky, that the sentence is an object of study in and of itself (Brown & Yule, 1983). This generative grammar approach is not concerned with either the producer or receiver of the utterance; the purpose, function and context are irrelevant to the analysis. Text linguistics, the product approach, acknowledges the existence of producers and receivers but is primarily concerned with the relationships between the elements of a sentence. This is the perspective used by Halliday (1994), and is also referred to as the "cohesion" view. Discourse analysis takes the "discourse as process" approach, adding a dialogical element to these earlier monological

studies. Here, words, phrases and sentences, whether spoken or written, are attempts to communicate a message, so the communicative function of language is the primary concern (Stubbs, 1984, van Dijk, 1985).

Discourse analysis—the study of naturally occurring language or language in use—takes both a pragmatic and a functional approach, and in doing so aids in formulating a conceptualization of social action and interaction. Each participant in a conversation has a role to play. The speaker/writer is at the centre of the communication process, while the hearer/reader interprets and draws inferences from what the speaker/writer has uttered (pragmatic role). This exchange, however, is not separate from the context in which it is conducted, nor the purpose for which it is conducted (functional role) (Brown & Yule, 1983). The important relationship in discourse analysis is between the speaker, the hearer, and the word, phrase or sentence rather than that between one word, phrase or sentence and another. A more detailed description of the different schools of discourse analysis can be found in Appendix A.

The Spoken and Written Word

Language, whether written or spoken, serves multiple and overlapping purposes. As a general rule, in literate cultures, speech is used to establish and maintain relationships (interactional function), and written language is used to record and transfer information (transactional function). When speech is used for transactional purposes, either the hearer records the information by writing it or the speaker repeats the information several times, clarifying as needed (Brown &

Yule, 1983). This pattern is quite apparent within the educational environment where not only do students turn to printed material such as textbooks for content, but also take notes during lectures. Instructors routinely repeat important information, often in different forms, and seek to clarify as needed.

Written discourse, while it exhibits notable differences from oral discourse, requires no less active involvement on the part of the participants than do speaking and listening as has been shown by research in cognitive psychology and psycholinguistics (Chandler, 1995). Spoken and written forms of language do, however, make different demands on language producers. For example, a speaker can completely counter the words spoken by using paralinguistic clues such as body language or intonation in ways that are denied to the writer. The distinction between the meaning of an utterance and what is meant by that utterance is a function of context (Grice, 1975). In "standard usage" (as the term is used in the context of conversational analysis), there is little or no difference between what the utterance or words mean and what we mean by them. In "non-standard use", however, there is a difference between what the words in an utterance mean and what the speaker intends. This variation in meaning often depends of the tone of voice used by the speaker or relies on the context. Irony and sarcasm are examples of non-standard usage (Odell, 1987).

Writers have access to a variety of tools with which to supplement the text and add a paralinguistic dimension. Such literary devices as metaphor, simile, or onomatopoeia add an extra dimension to the text, while the use of more that one

typeface, italicized or underlined type for example, can replicate some of the quality of spoken language. Creative or unusual spelling and punctuation can also be used for effect.

One of the more notable differences between speaking and writing lies in the lack of access the writer has to immediate feedback (Brown & Yule, 1983). In speech, the hearer uses linguistic and paralinguistic cues to develop a set of propositions. These may be extracted linguistically from the words directly (induction) or indirectly (inference). An utterance may contain many propositions, as in the case of metaphors, and the hearer must use reason and inference, contextual information and assumptions based on prior experience to interpret meaning. Context, in this sense, is limited neither to the immediate physical environment, nor to the conversation immediately preceding an utterance, although these are certainly factors. Shared assumptions and the mutual knowledge of the interlocutors both serve as aids to shared understanding. Successful communication "depends on the hearer selecting the *right* assumptions" (Blakemore, 1992, p. 18).

In text-based interaction, the reader uses induction and inference, prior assumptions and contextual information in much the same ways as does the listener (Stubbs, 1984). Readers of some types of texts, those commonly found within the academic community for example, might be actively engaged in evaluating the validity and considering the implications of the text—activities that

go well beyond information retrieval. The more experienced the reader, the more likely this is to be the case.

Barthes (1970) used the terms "*lisable*" or "readerly" and "*scriptible*" or "writerly" to describe the extent to which the text engages the reader in the process of making meaning. *Readerly* texts are those that are more accessible, straightforward and immediately understandable, while *writerly* texts require more effort on the part of the reader and are generally considered to be more difficult.

Classroom Discourse and "Teacher Talk"

Most classroom time is filled with spoken language. Teachers in the classroom continuously engage in organizing, explaining, summarising, reformulating and redirecting what has been said both by themselves and by students. According to Flanders (1970) of the 10,000 hours that children spend in the classroom, 70% of the time someone is talking, and the teacher talks for 70% of that time. Through these thousands of hours of exposure to teacher-talk, people learn appropriate behaviour for both teachers and pupils. Such talk not only conveys content, it also works to "convey a conception of how knowledge should be transmitted" (Stubbs, 974, p. 17).

The classroom environment has established its own set of communicative norms. Teacher-student interaction tends to be more highly structured, and, therefore, less complicated than casual conversation. For example, the "Initiate, Response, Feedback" (IRF) exchange structure is characteristic of much

traditional, formal teaching (Sinclair & Coulthard, 1975). This structure may vary somewhat depending on the circumstances. For example, the teacher may initiate an exchange that elicits student response but may not necessarily provide feedback. One difficulty with this description is that it does not acknowledge the ways that meanings are negotiated. It also implies that exchanges have a single function. Since any utterance, whatever its position in the IRF structure can serve more than one purpose, this somewhat idealized model does not appear to adequately account for the multi-functional nature of language (Stubbs, 1983).

Using Hymes' (1974) ethnography of speaking (meaning, channels, message form) as the basis for an analytical framework, Stubbs (1983) looked at the way "metalinguistic" language focuses on the underlying code. In particular, he investigated the process of "verbal monitoring" in classroom settings. He developed the concept of "metacommunication" (the controls on meaning, form and channels are all communication about communicating) and related it to Goffman's (1981) concept of social situations as events of mutual monitoring. To accomplish this he established a coding scheme for "teacher-talk" and provided a taxonomy of the way teachers control talk by referring to talk. Five overlapping and related categories depicting how teachers organize talk emerge from the data. These are:

1. control over channels of communication;
2. control over the amount of talk;
3. control over the content of talk;

4. control over language form; and
5. control over understanding (p. 15).

This unequal power relationship is further reinforced both by the physical arrangements of the classroom, where the teacher is free to move around, as well as by the teacher's dual role of evaluator and maintainer of order.

While this model of classroom interaction is still descriptive of many classroom environments, within the realm of adult education, more apparently egalitarian models based on principles of adult learning have replaced the teacher-controlled classroom. In this type of environment, it is possible that the communicative model might more closely resemble the apparently unstructured form that conversation takes outside the classroom. In fact, conversational analysis indicates that such exchanges are highly structured, but structured differently than in the traditional classroom model. In the peer group model, it is up to the participants to maintain order (through turn-taking mechanisms), maintain cohesion, and request clarification (Graddol, 1989; Sprague, 1993).

This arrangement removes instructors from the centre of communicative exchanges. It does not, however, remove them from the role of evaluator, so an imbalance of power still exists in that form. Another power imbalance also exists between students, in that not all will have developed their linguistic and communicative skills to the same degree. Research indicates that cultural as well as age and gender related factors can influence the amount of control participants have over the direction a conversation takes (Graddol, 1989; Tannen, 1990). It

should also be noted that after a lifetime of being socialized in classrooms where the teacher does most of the work, in the form of organizing discourse, eliciting participation and anticipating questions, some students resist assuming responsibility for taking a more active role in classroom interaction (Mason, 1990).

Discourse in the Asynchronous Learning Environment

Moore (1993), in his theory of transactional distance, defines distance not by geographical proximity but, rather, as the relationship between dialogue and structure. Transactional distance refers to the psychological space or communication gap between the student and the instructor. This space or gap must be bridged if learning is to be maximized. A decrease in transactional distance leads to a corresponding increase in critical, higher level thinking. This view is supported by Saba and Shearer (1994) who have observed that as learner control and dialogue increases, transactional distance decreases. This in turn leads to a demonstrated increase in critical thinking. Moore believes that computer conferencing can provide this bridge by increasing dialogue between and among learners and instructors. It can also promote more interactive instructional methods and learner autonomy.

The introduction of computer-mediated communication into the distance education environment has increased the potential for interaction between participants, and at the same time created the need to learn new ways to use language. Communication in the on-line environment differs from face-to-face

communication because the distinction between speaker/writer and hearer/reader is no longer clear. The distinction between spoken (interactional) and written (transactional) language is altered as well. Written language is called upon to accomplish both interactional and transactional functions. Shank (1993) characterizes network communication as neither oral nor written but as semiotic. The computer-mediated learning environment is both responsible for and reflects changes in socio-cultural norms (Herring, 1996). Ferrara, Brunner and Whittemore (1991) have questioned whether computer users constitute a 'discourse community' with shared communicative norms. They concluded that Interactive Written Discourse (IWD) is a hybrid form of written and oral language, arising out of a new social context, and that the norms of usage are becoming conventionalized.

The use of computer-mediated communication within this social context does not, however, reduce the need for social maintenance that exists in the learner centred classroom. If anything, this task becomes more difficult in computer conferencing because of the lack of paralinguistic cues. This results in an environment where participants more frequently engage in metalinguistic communication, that is, talking about the communication that is and has taken place (Graddol, 1989). Conversational mechanisms such as turn-taking and its role in topic development, which are generally taken for granted, are subject to different rules. For example, one participant can not prevent another from making a comment, nor can one participant interrupt another. Because of the

asynchronous nature of computer conferencing it is never 'too late' to add to the discussion. The technology also permits a number of different topics to be discussed simultaneously, which is a notable departure from face-to-face classrooms. The impact of these new communicative norms on the way teachers organize learning, or the effect they might have on the five categories of control identified by Stubbs (1984), are yet to be determined.

Computer-conferencing, as a specific type of computer-mediated communication has also been investigated, primarily in the contexts of education and organizational communication. The topics that have been most widely addressed in the literature to date include: changing roles of the instructor in the on-line learning environment (Berge, 1995; Collins & Berge, 1996); dynamics of on-line interaction (Eastmond, 1995; McConnell, 1994); learning networks (Harasim, Hiltz, Teles & Turoff, 1995); and pedagogical techniques (Paulsen, 1993). The communicative/linguistic aspects of electronic communications using e-mail, listservs and bulletin board services have been and continue to be studied (Sudweeks, McLaughlin & Rafaeli, 1997; Tella, 1992). Research that investigates the discourse properties of computer-mediated communication is more limited (Graddol, 1989; Yates, 1996).

Stubbs (1984) has classified studies of classroom language into one of three categories:

1. Insightful observation—exhaustive and/or impressionistic studies of selected commentary that require close attention to detail

2. Categorical studies—use coding schemes to categorize large amounts of real-time data in order to identify broad trends; and
3. Discourse analysis—the description of spoken discourse based on identifying units of analysis and determining relationships.

This framework is based on studies conducted in traditional face-to-face classrooms, but these categories can also be applied to studies conducted in non-traditional on-line classrooms. Some research, most of which examines instructor or learner perceptions of on-line communication, falls into the first category. This reflects the newness of the subject as an area of research. By far, the greatest numbers of studies fall into the second category, and these either examine the amount and distribution of participant interaction or the extent to which computer-mediated discourse resembles either spoken or written discourse. Discourse analysis, although increasingly being used to study such topics as political commentary, the media, and relationships of power in law and medicine, has not been used to identify and explore the way that participants in the on-line learning environment use language to assume or maintain control of the environment. Nor has discourse analysis been used any great extent to identify how participants use language to initiate and sustain higher order thinking within a community of learners. Language is so taken for granted and so inherent in each teaching/learning transaction that both it and the functions it serves are essentially invisible.

Participants

The 17 participants in this study are the instructor and the adult students in a graduate degree program that uses computer conferencing as a means of interacting. From this two-year program, I selected one course for analysis. I based my selection on a number of factors. First, this course occurred well into the program after the students had become familiar with the technology, with the learning environment, and with each other. Second, in exit interviews and questionnaires, both the instructor and the students expressed their satisfaction with the course and considered it to be a successful learning experience. I felt that this was important so as to preclude any perception that either the instructor or students were being evaluated. Finally, based upon my close observations of several dozen on-line courses in a variety of programs offered by several institutions, I consider that the interaction that took place between these participants was generally representative of on-line interaction within the adult post-secondary context.

Data

The primary data source that I used for this study consisted of the archived transcripts of the participants' on-line interactions over a period of eight weeks. The transcripts consist of 556 messages distributed among 27 subconferences. From these, I selected seven topic conferences, which were further divided into 22 small-group discussion conferences. The discussions were conducted entirely on-line. I excluded any discussions that comprised a combination of on-line and

video, audio, or face-to-face interaction. In addition, I had access to other instructional materials used throughout the course. These included the text book, the readings, and the course web pages.

Method

In this study of communicative interaction within an asynchronous learning environment, I have drawn from a variety of fields of study in an attempt to take a more holistic approach to what is an inherently complex subject. Each of these has its own set of theoretical frameworks, its own research traditions, and its own way of communicating research findings. I have tried to maintain a balance between the asynchronous communication, the sociolinguistic, and the social cognition perspectives.

Multiple Perspective Analysis

In the course of conducting this research, I have used a cross-section of research methods. I chose to do this after reading the arguments presented by Green and Harker (1988) in their work, *Multiple Perspective Analysis*. According to Green and Harker, "multiple perspective research involves bringing a number of different theoretical and analytic traditions to bear on a problem" (p. 3). This can be accomplished in several different ways. At one end of the continuum, members of a multidisciplinary research team may each bring their own theoretical or analytical perspective to bear on a single phenomenon. Alternatively, a team of researchers representing a single discipline or theoretical

orientation may use the same data set to answer different questions. At the other end of the continuum is the single researcher who engages in a secondary analysis of his or her data but either changes the theoretical framework, uses different methods, and/or asks different questions.

The advantage to taking a multiple perspective approach is that it is possible to present both a broader and a more in-depth analysis of the data. Each successive analysis highlights a different dimension of the problem, the data, or the theoretical framework. At times, one analysis may serve to validate another portion of the research. At others, it may reveal inconsistencies or contradictions—those elements that require further exploration (Nunn, 1996).

The complex character of multiple perspective analysis lends itself to examining complex questions, and the topic of communicative interaction is by its very nature a complex one that can be approached in a variety of ways. The role of language in learning

> ... can be conceptualized as a purely formal system of syntactic and semantic units, or as a system of resources for making meaning in context, an aspect of human social behavior, a communicative code, a mediational means in activity, a form of cultural capital, a tool for social action, a semiotic system, etc. We can study it analytically, developmentally, historically, interactively, socially, psychologically, culturally, comparatively, dynamically, politically, philosophically, educationally, and even

> biologically and physically. Each of these perspectives produces tools and research methods that may be of use in analyzing and interpreting particular kinds of data on learning" (Lemke, 1995, p. 2).

Following from Green and Harker as well as from Lemke, it appeared to me that it was necessary to examine the communicative interaction in this specific learning environment by using a number of conceptual frameworks and to ask questions representative of those frameworks. This meant that I would have to be prepared to apply a variety of analytical methods in order to answer those questions. As a result, the concept of multiple perspective analysis influenced my decisions on methodology throughout the study. I analyzed the transcripts from linguistic, cognitive and pedagogical perspectives. The range of analytical methods I used for each section of the study included software interaction analysis, surface interaction analysis, cohesion analysis, speech act analysis, discourse analysis, content analysis, and social network analysis. This selection drew from both empirical and qualitative models. Rather than describing each of these methods in detail in this section, I will introduce them at the relevant point in the study.

Credibility

One aspect of methodology that I will introduce here is that of credibility. Within the social sciences, much has been written on the subject of validity and

reliability. Kvale (1995) notes that, "in modern social science, the concepts of validity, reliability and generalization have obtained the status of a scientific holy trinity (p. 20)." Riffe, Lacy and Fico (1998) have gone so far as to claim that "failure to report reliability virtually invalidates whatever usefulness a content study may have" (p. 134). But, is it always appropriate to cite a reliability coefficient? Kvale calls such statements of reliability and validity "linguistic pacifiers" that give the reader a false sense of security, and permit them to accept what has been presented without questioning it as much as they might have otherwise. At the same time, he does not support the "relativism of antipositivism" but instead suggests that the concept of validity include new dimensions (p. 20). Perhaps, instead of relying on reliability coefficients, we should consider other ways of assessing the creditability of what we read. Reason and Rowan (1981b) suggested that a diverse mix of approaches is desirable.

The first of these approaches is face validity. Do the observations and findings look right to the discriminating observer? While this study was in progress, I was fortunate to have been able to share my observations with others working in asynchronous environments. In addition to discussions with colleagues, I have also presented my findings at conferences and was gratified to find that they appeared broadly representative of others' experiences. In other words, they "looked right" to those with experience in the field.

Another measure of validity is context validity. Two questions should be answered in order to determine context validity. Is the behaviour being studied

representative or typical of the participants, and is it typical of the environment? In answer to the first question, because I had observed these participants over a two-year period, I was confident that their behaviour in this course was what I would have expected from them. As to whether their behaviour was what would typically take place within such an environment, I must again draw on my experience. I have had the opportunity to observe several dozen on-line courses from the perspective of student, instructor, course developer, participant observer, and research coordinator. The participants in this course did not display any previously unobserved behaviours.

One final aspect of context relates to shared context. This is particularly pertinent to transcript analysis. Frequently, the interaction takes place under one set of circumstances, while the transcriber, coders and analyst are far removed from that situation. There is a sense of immediacy to an asynchronous interaction that is lacking when transcripts are read after the discussion has concluded. Because I was able to observe the discussion as it unfolded, that is, I shared the context, I was able to share in that sense of immediacy. At that time, I maintained a journal of my impressions of the interaction, noting when the discussion was intense, when it lagged, and what events were taking place concurrently that might be affecting the discussion.

Perhaps just as important as validity is accuracy. The greatest source of inaccuracy is in the transcription process. When transcribing verbal interaction, whether face-to-face or over the telephone, much depends upon the skill of the

transcriber and the quality of tapes. In addition to errors at the word level, it can be difficult to accurately represent pauses, hesitations, false starts, inflections and repetitions. The level of difficulty increases when the transcriber must account for overlap between speakers. Transcripts of computer-mediated conversations, however, are not subject to the same constraints. Text-based interaction is naturally occurring conversation conducted in a form that is transcribed by the speaker/writer. Phonological ambiguity is resolved.

Redundancy in design can also be used to ensure accuracy. For example, in the first part of the study, the data were subjected to three different types of analysis: software interaction analysis, surface interaction analysis and cohesion analysis. No coding was involved in the software analysis; it was essentially a matter of counting. Nor did identifying surface links entail making any subjective decisions. The same was true of cohesion analysis. Identifying lexical links was not a process that required making subjective decisions. In the interests of accuracy, however, I mapped the entire corpus twice, both manually and electronically. I also performed all calculations manually and again using statistical software. This enabled me to identify any discrepancies and locate their source, thus ensuring the elimination of errors in data entry.

Finally, because I conducted the research without the aid of a team of coders, inter-rater reliability was not an issue. For that same reason, though, stability was a crucial component. To ensure that the coding process was stable, I recoded the data until all inconsistencies were resolved. That is, after coding the

transcripts, I repeated the procedure and noted any discrepancies between the way the text had been categorized in each pass. The inconstancies (which, it should be noted, were remarkably consistent) were specifically addressed during the second part of the study.

The third part of the study proved to be the most difficult in terms of determining whether my descriptions truly represented what occurred in the discussion. Berelson (1950) defined content analysis as an "objective, systematic, and quantitative description," but objectivity is not a useful concept when used in relation to language. Language is embedded in context, and that was very evident during this analysis. At one point I tried having a third party code a sample of the transcripts independently, but this proved futile. For one type of codes there was perfect agreement, which is what would be expected since any native speaker would be able to identify these simple syntactic forms (Pinker, 1994). That was far from true, however, for the second set of codes. In this case, knowledge of the context was essential if the codes were to be applied correctly. Yet, it would be unreasonable to expect another person to immerse themselves in all of the material surrounding the course, including reading the transcripts from previous courses so that they could recognize if a topic was a new one, or if it was one that had been discussed six months earlier. So, in the end I had to concede that this part of the research was likely not reproducible. But then, that is true for much linguistic or ethnographical research where, rather than repeating an experiment, each individual study contributes to the understanding of a particular

phenomenon. In such cases, we must again return to face validity and ask, does it look right? In that I am confident. Those that have read the study say that it speaks to their experience, and that is all that I can ask. The purpose of this research was not to discover something new and exciting but, rather, to illuminate a small portion of the ordinary and everyday, so that the reader can say, "yes, that happens with my class," or "no, that doesn't happen, but I can see why."

Limitations

This sample is representative of interaction within a specific computer-mediated context. Specifically, participants are themselves adult educators, and this should be considered by the reader when attempting to determine whether the conclusions are generalizable or transferable to a different population. But just as Stubbs' (1974; 1984) and Dobson's (1995) use of theoretical samples (English as a Second Language teachers) served to emphasize the linguistic transactions that occur at a more subtle level in everyday classroom interaction, so might this theoretical sample reveal the facilitative linguistic strategies used by adult educators in both on-line and face-to-face learning environments.

Delimitations

On-line communications were conducted using the FirstClass© conferencing system. While participants communicated in face-to-face settings, over the telephone and by fax as well as by using the private e-mail and

synchronous discussion capabilities of the FirstClass conferencing system, only those messages posted to group conferences were considered in this study.

Ethical Considerations

The question of whether messages posted on electronic bulletin boards, listservs, and newsgroups should be considered private or public in nature is the subject of continuing debate. Although this debate has not been carried into the realm of educational computer conferencing to the same extent, there are many issues that must be considered with a primary concern being one of respect for persons (Evans & Jakupec, 1996). Sudweeks and Rafaeli (1996) are the coordinators of the landmark ProjectH study that comprises more than 100 researchers working collaboratively in the area of computer-mediated communication. The process of establishing ethical guidelines for the project took more than eight months of scholarly debate and addressed such issues as the public nature of computer-mediated discourse and the rights of the authors of postings. In the end, it was decided that:

a) postings to public areas of a conference are comparable to letters to the editor—personal but public nonetheless—and that analysis of such postings is not a violation of privacy.

b) use of posted messages is subject to professional and academic guidelines. Short excerpts may be used for illustrative purposes without seeking the permission of or citing the author. (In addition, Herring (1996) elaborates on the crucial distinction between this usage and that where the message is

cited to either credit or argue against its content. In the latter case, the citation should be treated as a published reference.)

c) the identities of participants must be protected.

These guidelines have become widely accepted within the research community, and I have taken each of these points into consideration when designing my study.

a) Participants in the computer-mediated conferences being analysed were aware that other instructors, program administrators, and researchers would read the comments posted in the public areas of the conference. Participants gave their permission allowing access to those messages included in the personal but public category. Participants also had the option of posting messages outside the course conference area. These messages were considered personal and private. No private communications between students or between students and instructors, whether posted on either the conferencing mail-system or the on-line chat system, formed any part of the data.

b) Only short excerpts from the archived transcripts have been used to illustrate the phenomenon being discussed.

c) To ensure confidentiality and shield the identities of participants, pseudonyms have been used in any portions of message text used for illustrative purposes.

d) This study was designed to examine the linguistic structures of on-line discourse and to analyse communicative structures rather than the communicators.

e) Finally, an ethics review board approved the proposal.

Organization of the Study

Interaction in a text-based environment, as is true of communicative interaction in general, is a complex subject. It is also too broad a subject to contemplate as a single entity. Taking a multiple perspective approach to the use of language within the context of an asynchronous learning environment, I have chosen to focus on three specific areas of this interaction by treating each area as a separate research study. While each study is distinct, they are still related as parts of the whole, with one part building on and extending the findings of the others. In the following three chapters, I present these studies in the form of individual research papers. In the first paper, I focus on the topics of participation and cohesion in on-line interaction. In the second, I characterize "teacher talk" and "learner talk" within an on-line environment. In the third, I examine the syntactic form and cognitive function of participants' questions. In the final chapter, I synthesize the findings of the three papers.

Assumptions

I believe that learning and cognition can be enhanced through interaction in a community of learners (social cognition theory), and that language is the most

important tool we have for mediating these interactions. From birth we have been socialized to function within particular environments and circumstances, and throughout our lives we learn to adapt to new ones. We do this, in part, by observing and imitating the behaviours of others. It is to be hoped that the behaviours we emulate are, in fact, appropriate. Within the computer-mediated learning environment, we are all gingerly feeling our way along, hoping that we are doing and saying the right things, relying partly on intuition, partly on raw nerve. I find myself in a role where I must advise others on ways to communicate in this new environment, and while there are some individuals that seem prepared to stand up and say that things should be done thus and so, I feel far more tentative when I make suggestions. I see the world and my relationships with others as being dependent on language and my ability to express what I mean in a way that will nurture these relationships. My uncertainty about the role of language in this new environment makes me feel as if I am standing on shifting sands. I am hoping that this work will make the ground under my feet feel a little more solid.

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Preface to Paper 1:
Participation, interaction and cohesion:
Adapting conversational strategies in the online classroom

For the first part of this three-part study, I examined the salient elements of asynchronous interaction—discourse practice and participant involvement. My intent was to determine if the participants developed and maintained cohesion in this online learning environment and, if so, how this was accomplished. This meant that I had first to determine whether the participants were, in fact, participating. Then I had to ascertain whether this participation was interactive in nature; were the online contributions part of a discussion? Finally, if the participants were carrying on an interactive discussion, I had to learn whether this discussion was integrated or whether it lacked cohesion.

Taking a multiple perspective approach (Green & Harker, 1988), I used three different analytical methods to study transcripts of the online interaction: software interaction analysis, surface interaction analysis, and cohesion analysis. At the same time, I compared these research methods and evaluated their ability to detect specific characteristics of online interaction.

One of the challenges I faced in this section was determining the most effective method of mapping the interaction. I tried several methods before choosing to identify the individual messages as numbered circles or rectangles with arrows between these numbers indicating the direction of interaction. One other mapping method was particularly effective at showing the extent (or lack

thereof) of "topic drift" (Hewitt, 1997) and the "recency effect" (Graebner, 1998) (Figure 1).

In this representation, a number on the perimeter of the circle indicates each message. Any time a message linked to an earlier message, a line indicates that reference. As can be seen in Figure 1, messages consistently linked back to earlier messages, particularly the first message. If the discussion had drifted away from the topic, or if participants responded only to the most recent messages, points would be connected to only those that immediately, or nearly immediately, preceded them. Topics introduced early in the discussion would have been abandoned, and the centre of the circle would remain empty. This mapping method also worked well to illustrate the extent of interaction at the level of software analysis, but it became difficult to read when the surface and lexical analysis methods revealed more complex patterns of interaction and cohesion.

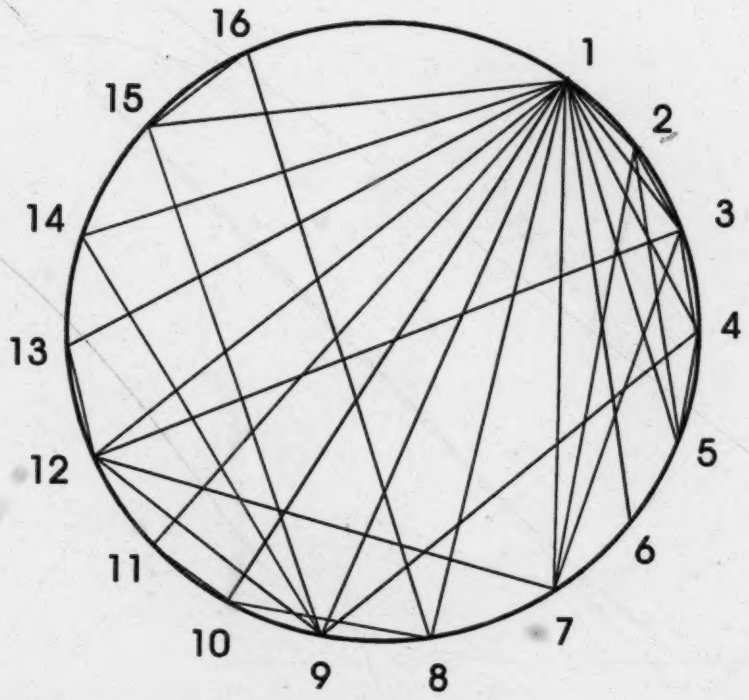

Figure 1: Map of Lexical Cohesion Linkages

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Participation and interaction: Maintaining cohesion in asynchronous discourse

Introduction

The literature on adult learning theory maintains that learning is a social experience, and research supports the idea that interaction between and among learners is an important component of an effective learning environment (Graddol, 1989; McConnell, 1994; Moore, 1993). The literature on computer-conferencing and computer-mediated communication identifies learner-learner interaction as an essential form of classroom interaction (Hillman, Willis & Gunawardena, 1994; Moore, 1993). The opportunity for interaction with other learners, in both structured and informal contexts, is one of the primary advantages of using text-based asynchronous communication (Stock McIsaac, Blocher, Mahes & Charalambos, 1999). There is some disagreement about not only the amount of participation that actually takes place in on-line classes, but also the value of student interaction. Some (Fjuks, 1993; Henri, 1992; Kearsley, Lynch, & Wizer, 1995; Kiesler, 1992) see the opportunity to work with other students and learn through collaboration as a major benefit of computer-mediated conferencing, while others (Bates, 1995; Laurillard, 1993) have expressed concerns about the role of student-student discussion as an end in itself.

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Although a text-based communication technology such as computer-conferencing is used to support interaction between participants, some barriers still exist that can limit the extent and effectiveness of the interaction. First, on-line discussions extend over a much longer period of time than do face-to-face conversations. Participants have expressed difficulty managing the volume of messages that accrue in these attenuated discussions (Stock McIsaac & Ralston, 1996; Wells, 1993). This is particularly notable in situations where instructors utilise an unstructured, open discussion model of interaction (Pincas, 1998). A second barrier to effective discussion lies in the difficulty following the thread of on-line discussions (Bullen, 1998; Pincas, 1998; Winiecki, 1999). The technology permits a number of different topics to be discussed simultaneously, which is a notable departure from face-to-face classrooms. To compensate for the non-linear format that typifies asynchronous communication, Levin, Kim and Riel (1990) recommend the use of 'threaded' software that allows users to sort messages according to subject line or 'thread'. Pincas (1998) also suggests that a protocol be established for standardising the subject line of messages to help participants follow the progress of a discussion, while Hewitt (1997) maintains that threaded software is itself a barrier to interaction.

Coping with unconventional conversational norms—norms that are still in the process of evolving—presents another challenge for participants. Conversational mechanisms such as turn-taking and its role in topic development, which are generally taken for granted, are subject to different rules in an

asynchronous context. For example, one participant can not prevent another from making a comment, nor can one participant interrupt another. Because of the asynchronous nature of computer-conferencing it is never 'too late' to add to the discussion, although (Graebner, 1998) has identified problems related to the "recency effect" wherein messages attract responses for only a very limited period of time. Much has been written about the one-to-one, one-to-many, many-to-many modes of interaction between and among participants in on-line discussions (Harasim, 1989; Paulsen, 1997). These are usually compared to monologues, dialogues, and conversations in the face-to-face context. Shank (1993) maintains that a face-to-face conversation consists of a combination of monologues and dialogues. He uses the term "multilogue" to describe the act of participating in on-line interactions where one both receives input from and contributes to a number of simultaneous discussions.

The resulting nonlinear topic development is characteristic of asynchronous communication. It has also been cited as one of the causes of topic or conversation drift, which results from increased divergence and prevents the development of focussed, productive discussion (Hewitt, 1997). The perceived difficulty that participants have in carrying on a cohesive discussion because of this lack of linearity has lead to a recommendation that instructors engage in frequent weaving or summarising of ongoing discussions (Berge, 1995; Collins & Berge, 1996). Asynchronous communication has also been credited with removing control of the discussion from the instructor and facilitating a more

learner-centred type of interaction (Murphy, Cifuentes, Yakimovicz, Segur, Mahoney & Kodali, 1996).

The Study

The subjects in this study are participants of a graduate degree program that utilizes computer-conferencing to facilitate interaction. One of the courses in the program was selected for analysis. Both the instructor and the students expressed their satisfaction with the course and considered it to be a successful learning experience. The transcripts of their on-line interactions, conducted over a period of eight weeks, consist of 556 messages distributed among 27 subconferences. After excluding from the analysis any discussions that used a combination of on-line, videoconference, and face-to-face interaction, 365 messages remained. These messages were posted in seven topic conferences, which were further divided into 22 small-group discussion conferences. These discussions were conducted entirely on-line.

This sample is representative of interaction within a specific computer-mediated context. Specifically, participants are themselves educators or educational administrators, and this should be considered by the reader when attempting to determine whether the conclusions are generalizable or transferable to a different population. But just as Stubbs' (1974; 1984) and Dobson's (1995) use of theoretical samples (English as a Second Language teachers) emphasised linguistic transactions that occur at a more subtle level in everyday classroom

interaction, so might this theoretical sample reveal the facilitative linguistic strategies used by adult participants in both on-line and face-to-face classrooms.

Method

The messages exchanged in these conferences were analyzed using a selection of methods:

1. software interaction analysis
2. surface interaction analysis
3. cohesion analysis

These methods were selected based on their suitability to provide specific types of information or answer different types of questions such as:

- duration of discussions (e.g., What is the optimum length of time to allow for an active on-line discussion?);
- individual participation (e.g., To what extent is the number of messages posted indicative of participation?);
- degree of interaction (e.g., What is the extent of learner-learner interaction?); and
- characteristics of interaction (e.g., Does topic drift prevent topic development?).

The data obtained through each of these methods were mapped to identify patterns of interaction and subjected to a statistical analysis.

Software interaction analysis

Participants in this study used SoftArc's FirstClass computer-conferencing software for their on-line discussions. This software allowed messages to be sorted according to either the date and time each message was sent, the name of the sender, or the topic indicated in the subject line. In the latter case, any responses that utilized the software's reply function were grouped with the original message. This facilitated the process of determining the chronology of the interaction, counting the number of messages sent by each participant, and tallying the number of times the "reply" function was used by participants when responding to earlier postings. This can be done from an index or message log without ever having access to the messages themselves.

Surface interaction analysis

Surface interaction analysis is conducted manually and goes one step beyond the software interaction analysis. It is used to identify linkages that are not evident from an index of messages—that is, instances when the sender did not use the software's reply option but, instead, manually replicated the function. For example, participants may refer to previously posted messages by explicitly quoting the original material. This material may either be "cut and pasted" into the new message, or else retyped verbatim. duBartell (1995) refers to the use of quoted material in electronic communication as "adhesion." A second type of surface linkage occurs when the author or authors of earlier postings are specifically addressed by name. While the appearance of a name in a message is

obvious, it does not always indicate a link to an earlier message. Sometimes names are used to acknowledge or greet other participants as they join the group. The distinction between the two types of nomination practices is readily apparent. Surface interaction analysis allows the researcher to identify messages that refer to more than one previously posted message. The software reply function does not support multiple linkages.

Cohesion analysis

Cohesion analysis was used to determine the degree of lexical and grammatical cohesion between the messages. Nunan (1993) defines cohesion as the "formal links that mark various types of inter-clause and inter-sentence relationships within the discourse" (p. 116). The existence of these links or ties determines the coherence of the discourse or the "extent to which discourse is perceived to 'hang together' rather than being a set of unrelated sentences or utterances" (p.116). These ties are generally considered to link one part of an utterance to another, but they may also serve to link utterances made by participants in a conversation (Jara, 1999). It is these cohesive links that form the distinction between a coherent conversation and a set of unrelated speeches, even speeches about the same topic. The two categories of cohesive ties are grammatical and lexical (Bloor & Bloor, 1995; Halliday, 1994; Halliday & Hasan, 1976). These include reference, substitution and conjunction, synonyms, and reiteration. As the name suggests, referential forms are those that can only be interpreted in light of information found elsewhere. References include pronouns

such as he, she, and them, as well as quantifiers and determiners such as many, some, these or those. Substitution occurs when one lexical item is replaced with another to avoid repetition of the first, as in the example "I wrote the exam yesterday. After *that,* I went to work." When the lexical item is replaced with a null phrase (∅) it is called ellipsis--"After (∅), I went to work." Conjunctive forms include not only conjunctions such as *and*, *but*, or *however*, but also discourse particles such as *well* or *so*. Examples of cohesive ties have been extracted from the data and are presented in Table 1.

Table 1. Data Illustrating Grammatical and Lexical Ties

Cohesive Tie	Example
Reference	
pronouns	I would like to consider *them* together.
quantifiers/ determiners	*These four* principles are applicable.
Substitution	
lexical	I find *this* almost an impossible thing to do. (*this* substitutes for *measuring*)
ellipsis	I wish I could, fully. I wish I could (*identify*) fully (*with Roger's role...*).
Conjunction	
conjunctive	*And* I'd like to remind you that…
discourse particle	*Well*, it is interesting that we are all heading in the same direction.
Reiteration	
repetition	The phrase "intentionally inviting" repeated 12 times in 1 subconference

Findings

The different analytical methods revealed increasingly detailed information about the data. The amount of information to be gleaned from each

method was in direct proportion to the demands placed on available resources. Software analysis requires the fewest resources in terms of time because it is not necessary to read the content of the messages. In fact, third-party software is available that will provide many of these results in even less time. This may explain why so many studies of on-line interaction use this type of data, particularly when large data sets are to be analysed. Surface linkages are relatively easy to identify, albeit somewhat time-consuming. This level of analysis is not uncommon when data sets are moderately-sized. Studies that examine data at the lexical level are quite resource intensive and as such, tend to be limited to relatively small sample sizes. The average data set for this type of analysis is between 50 and 100 messages (Harrison, 1998, Howell-Richardson & Mellar, 1996; Jara, 1999).

Duration of discussion

The first type of information to be extracted from the data relates to the duration of each discussion. This was determined by comparing the dates on which the first and last messages were posted to each conference. Each of the seven topic conferences was scheduled to cover different lengths of time, ranging from 2 to 7 days. According to the dates when the first and last messages were posted to each conference, the average length of the conferences was 10 days.

Plotting the number of messages posted per day to each conference presented a somewhat different picture of the duration of the interaction. For example, there were periods of up to a week where no messages were posted to

the scheduled discussions. In one case, the cause was organizational--the introductory message for the first conference was posted 7 days before the course began. In another conference, the instructor posted closing messages a week after a discussion had ended. Messages posted by students also contributed to the appearance that discussions spanned extended time periods. In one case a student mistakenly posted a message to a conference that had been closed. This message was then followed by an apology. Another student posted messages to a conference several days after all discussion had ceased. These messages referred to a face-to-face meeting that had taken place during the interim.

Conference F1 (Figure 1) is illustrative of the pattern of participation in each of the three extended conferences: A (13 days), E (12-13 days) and F (20 days). This pattern is typified by a short period of intense activity followed by stretches with little or no activity. In this case, 81% of the messages were posted over a period of four days. So, rather than having a 20-day span, this discussion was effectively finished after 7 days.

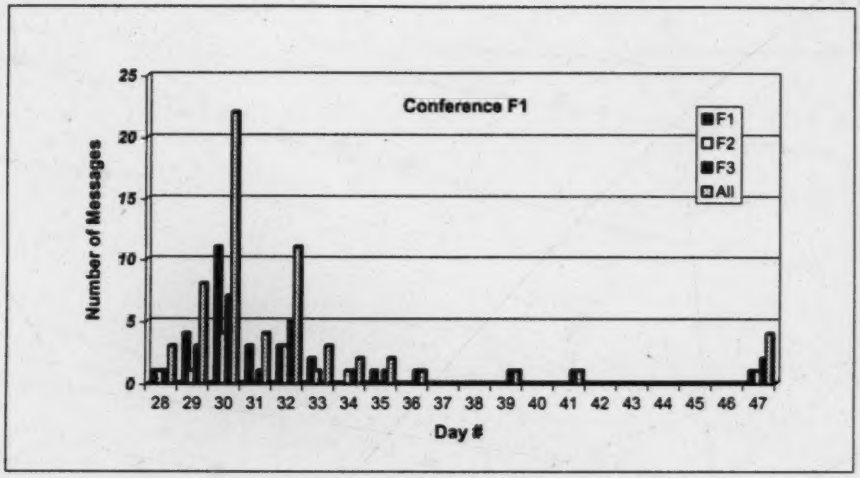


Figure 1. Duration and distribution of activity in conference F1

Using the start/end date from the index of messages produced by the software consistently over-estimated the duration of the conference. Rather than an average of 10 days, the period of active discussion spanned, on average, a period of 6.5 days (Table 2). Conference length, as determined by the software, was significantly greater than the number of days of active discussion. Using a correlated one-tailed t-test, the *t*-score of 3.75 was significant at the .005 level.

Table 2. Number of Days Each Discussion Spanned

Conference	Scheduled	Duration*	Active†
A1	3	13	6
A2	3	13	6
A3	3	13	5
B1	2	6	6
B2	2	7	7
B3	2	6	6
C1	7	5	5
C2	7	8	5
C3	7	5	5
D1	2	8	8
D2	2	7	7
D3	2	8	8
E1	3	12	7
E2	3	12	5
E3	3	13	5
F1	6	20	8
F2	6	20	7
F3	6	20	9
G1	7	7	7
G2	7	7	7
G3	7	7	7
G4	7	6	6
M	4.4	10	6.5
SD	2.2	4.9	1.2

*Duration determined by dates of first and last message.
†Active until 2 consecutive days without postings.

Rates of participation

Another type of analysis that appears frequently in the literature is a simple measure of individual participation arrived at by counting the number of messages posted by each participant. As was the case when determining the duration of a discussion, this tabulation can be conducted by using the

information in the conference logs. Quite different results were obtained, however, when this process was repeated using a surface analysis (Table 3). Discrepancies arose from 3 different sources. First, something that was not evident in the software analysis was that 2 participants were unable to access the conference for a portion of the course and had other people post messages on their behalf. This affected 8 of the messages and was easily identified in the surface interaction analysis. Second, some students posted collaborative contributions. Only the individual whose logon id was used to post the message was credited with the contribution, but, again, this group effort was immediately apparent upon reading the message. The third, and most challenging cause for the discrepancy relates to the inability of the software to allow participants to reply to more than one message even though participants frequently do this. While most participants responded to only one message, others preferred to reply to several at one time. Messages that referred to multiple postings constituted 8% of the total, but they referred to 21% of the messages. Of these multiple responses, 81% replied to 2 previous posting, 16% referred to 3, and 3% replied to 4.

Table 3. Number of Messages Sent by Participants

	software id	corrected logon id	multiple replies	surface id
instructor	69	69	1	70
student 1	28	22	0	22
student 2	15	16	3	19
student 3	32	32	10	42
student 4	26	26	3	29
student 5	27	27	1	28
student 6	21	21	3	24
student 7	13	12	2	14
student 8	24	24	8	32
student 9	14	14	6	20
student 10	18	18	0	18
student 11	18	17	2	19
student 12	12	12	0	12
student 13	9	9	1	10
student 14	21	21	1	22
student 15	18	18	1	19
student 16	0	7	0	7
Total	365	365	42	407
M	19	19	3	21
SD.	8	7	3	9

Mean and standard deviation do not include messages posted by instructor.

From a statistical perspective, the number of messages sent by individual students, as determined by the surface analysis was significantly greater than the number as determined by the logon id feature of the software. A correlated one-tailed t-test resulted in a *t*-score of 4.197, which was significant at the .005 level.

Extent of Interaction

Using both the software and surface cohesion data, linkages between messages were mapped. Such mapping clearly distinguishes between instructor-student and student-student interaction. In addition to highlighting patterns of

interaction, mapping facilitates the identification of messages that initiate discussion threads as well as messages that stand in isolation. Figure 2 illustrates the inter-message links that were identified by analyzing the software-generated data for Conference A2, while the map in Figure 3 is based on features of surface cohesion in the same discussion.

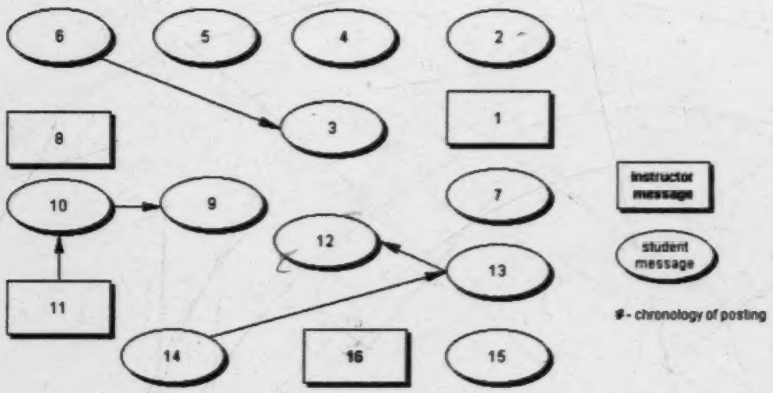


Figure 2. Map of Conference A2 software links

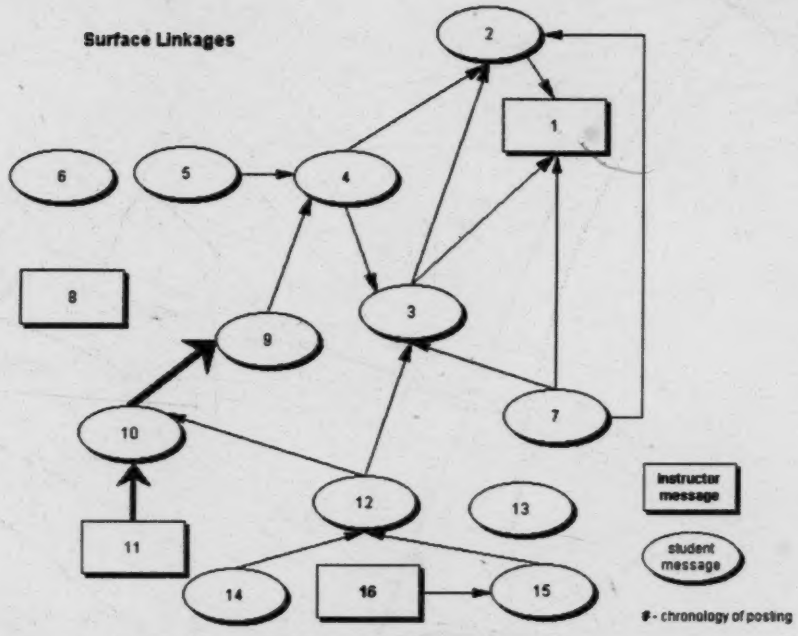


Figure 3. Map of Conference A2 surface cohesion links (*bold arrows indicate presence of both software and surface links*).

Mapping participant interaction according to markers of lexical cohesion resulted in the production of message maps that were difficult to follow primarily because of the extensive number of links made to the instructor's initial posting (Figure 4).

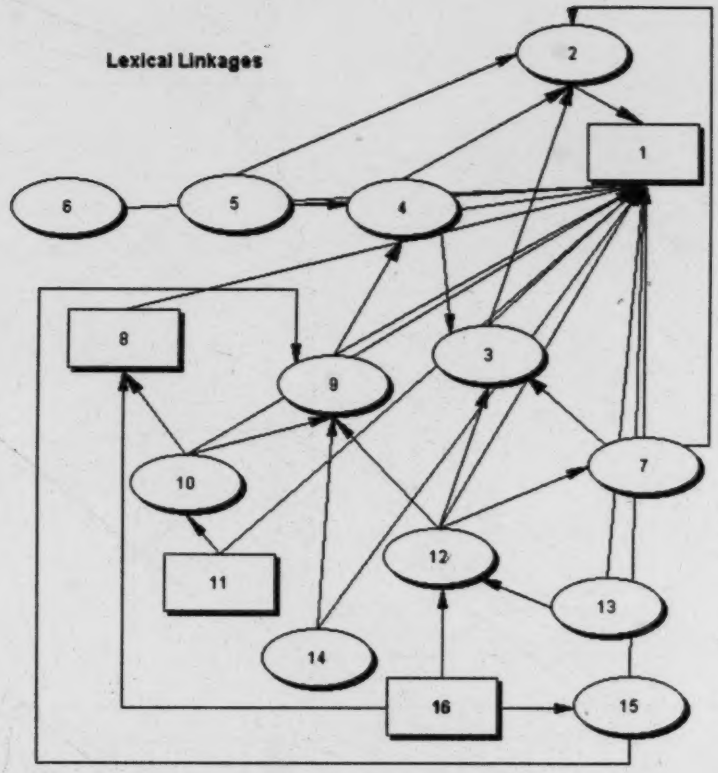


Figure 4. Map of Conference A2 lexical cohesion links

This pattern was consistent throughout the 19 discussions. Of the 365 messages posted, only 63 of them, that is 17.3%, did not make a lexical reference to the instructor's initial posting. This was a notable difference from the number of times students linked to that initial posting using either the software reply function or by using a type of surface cohesion (Table 4).

Table 4. Number of Messages That Do NOT Refer to Instructor's Initial Posting

	Software	Surface	Lexical	Total #
A1	15	8	0	17
A2	15	12	1	16
A3	17	10	4	18
B1	13	10	3	14
B2	13	14	0	15
B3	10	7	3	11
C1	19	10	0	20
C2	9	1	0	10
C3	19	10	0	20
D1	25	25	8	26
D2	10	8	0	11
D3	19	19	2	20
E1	14	14	3	15
E2	13	12	4	14
E3	16	16	5	17
F1	24	24	5	26
F2	11	10	0	12
F3	23	23	7	24
G1	5	6	1	7
G2	16	17	4	18
G3	14	13	5	15
G4	18	13	8	19
Total	338	282	63	365
M	15	13	3	17
SD	5	6	3	5

To facilitate further analysis, lexical linkages to the instructor's initial posting were considered to be the norm and, as such, were not indicated on the maps. Those messages not linking to that initial posting were considered to be the "marked" form and were noted on the map as illustrated in Figure 5.

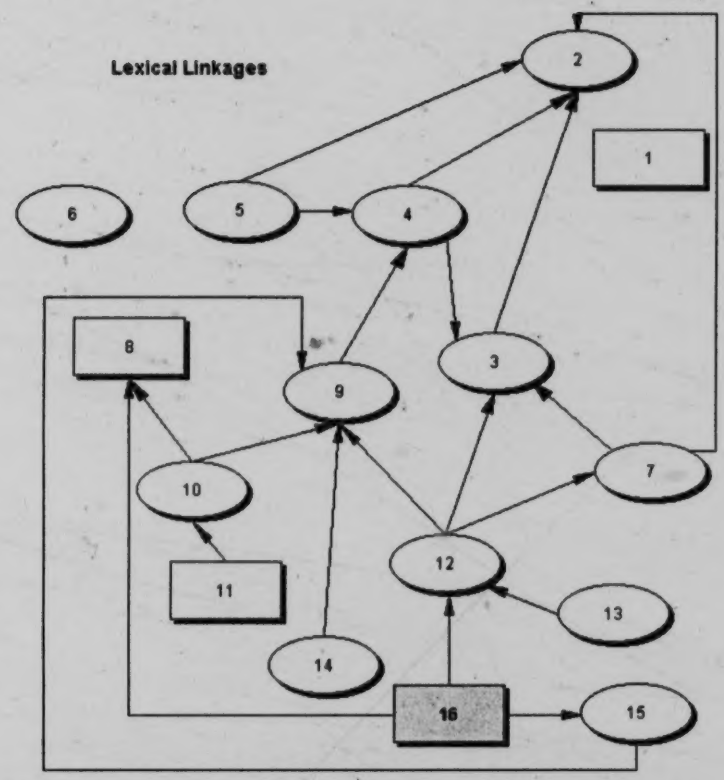


Figure 5. Map of lexical cohesion linkages (*shading indicates that the message did NOT link to instructor's initial posting*).

From a statistical perspective, the extent of interaction—that is, the number of messages that link to earlier messages, as determined by markers of surface cohesion—is significantly greater than the extent of interaction as determined by the use of the software reply function (t=7.09). Even when the number of surface linkages was reduced to account for messages that used both software and surface linkages, the difference was still significant (t=6.01). Both scores are significant at the .005 level. Lexical linkages were used more

frequently than software or surface linkages combined. The data from all 19 subconferences are tabulated in Table 5.

Table 5. Extent of Interaction as Determined by Linkages

	software	surface & software*	surface	lexical
Total	101	217	152	577
M	5	10	7	26
SD	3	6	5	11

*those messages that used the reply function as well as a surface link

Characteristics of interaction

The different analytical methods also vary in their ability to identify specific characteristics of on-line interaction. This was true of messages that addressed other postings, as well as those that did not (Table 6).

Table 6. Messages Linked to Previous Postings

	Instructor to instructor		Instructor to student		Student to instructor		Student to student		Unlinked messages	
	#	%	#	%	#	%	#	%	#	%
Software links	0	0	9	2.5	17	4.7	75	20.5	194	53.1
Surface links	0	0	14	3.8	60	16.4	143	39.2	123	33.7
Lexical links	41	11.2	51	14.0	258	70.7	227	62.2	7	1.9

total number of messages posted = 365

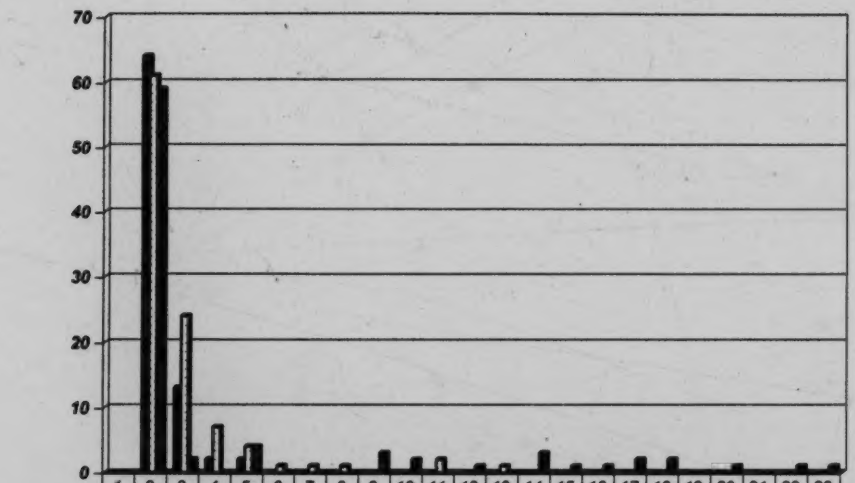
A correlated (paired) 1 tailed t-test showed that instructors used surface links to tie to student messages significantly more frequently than they used software links (t=3.05). Students also used surface linkages significantly more often than they did software links, both when they tied to instructor messages (t= 4.08) and to messages posted by other students (t= 7.09). In all instances, the

t-score was significant at the .005 level. Both levels of analysis, however, indicate that student-student interaction predominated. This contrasted with the findings of a lexical analysis where it was found that the number of student-to-instructor links exceeded the student-to-student links. Regardless of the type of analysis used, it was evident that the students replied to messages posted by the instructor more frequently than the instructor commented on student messages.

The number of isolated messages identified by each of the three methods differed widely. An isolated message was defined as one that did not connect to a previously posted message or that was not linked to by any subsequently posted message. A software analysis gave the impression that more than half the messages were isolated. This would indicate that little interaction took place and that participants simply posted their comments without referring to earlier contributions. Although that number decreased by 19.4% when surface cohesion was considered, one third of the messages still did not appear to contribute to the conversation. The number of messages standing in isolation as determined through a lexical analysis, however, is negligible. At less than 2%, this indicates that the conference discussions were, in fact, highly interactive.

Mapping the interaction highlighted another characteristic of the on-line discussion. No matter which analytical method was used, it was apparent that the typical exchange consisted of only two messages--the initiating message and a response (Figure 6). Analysis indicated that this was the case for 79% of the software exchanges, 59.8% of the surface exchanges, and 71% of the lexical

exchanges. The different analyses did, however, provide quite different information pertaining to the number of longer exchanges. Software cohesion analysis did not identify any exchanges consisting of more than five messages, with three-message exchanges totalling 16%, and four- and five-message exchanges each accounting for 2.5% of the messages. The results of the analysis based on surface cohesion showed a similar diminishing trend with 23.5% of exchanges containing three messages, 6.9% containing four, and 3.9% containing five. In this case, however, 5.9% of the exchanges contained between six and 13 messages. According to the analysis of lexical cohesion, exchanges comprising three to five messages occurred with the same frequency as exchanges of between six and 13 messages (7.2%). In contrast to software and surface analysis, lexical analysis revealed that 14.5% of the exchanges comprised from 14 to 23 messages.



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Software	0	64	13	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Surface	0	61	24	7	4	1	1	1	0	0	2	0	1	0	0	0	0	0	0	0	0	0	0
Lexical	0	59	2	0	4	0	0	0	3	2	0	1	0	3	1	1	2	2	0	1	0	1	1

Figure 6. Number of messages per exchange as determined by each analytical method.

There was some evidence of a difference in the way that males and females used cohesive strategies to respond to multiple previously posted messages (Table 7). On average, female students used surface links for this purpose 6 times as frequently as did male students, and lexical ties 3 times as often. Using a Chi-square test, the difference between expected and actual use of these linking strategies by males and females was significant at the .005 level. The instructor also tended to use lexical rather than surface cohesion to refer to several earlier postings at one time. Lexical ties were used 13 times to refer to 37 prior postings, while a surface link was used only once.

Table 7. Student Responses to Multiple Previously Posted Messages

	Females (n=12)		Males (n=4)			
	#	% of total	#	% of total	Total #	χ^2
Surface links	39	95.12	2	4.88	41	8.85
Lexical links	112	88.89	14	11.11	126	12.96

Finally, it was found that a large proportion of messages linked to the immediately preceding message. This trend was evident for all three methods of analysis. An analysis of surface cohesion, however, showed that of the 54 postings that referred to the immediately preceding message, 14 (26%) also linked to earlier messages, with 4 of these linking to messages that had been posted more than five turns prior. Lexical analysis revealed even more complex patterns of interaction. Of the 98 messages that referred to the immediately preceding message, 83 of them (85%) also linked to earlier postings with a total of 128 links. Fifty percent of these linked to messages posted 10-20 turns earlier. On average, participants linked their contribution to one posted seven turns earlier.

Discussion

Duration of discussion

This course employed two structural features in an attempt to reduce the volume of messages that participants were required to manage at any given time. First, the course was structured so as to limit the number of concurrent discussions. Second, in all but one conference (Conference F), students were asked to participate in only one subconference, so as to replicate the small-group

interaction that takes place in the face-to-face context. The students appeared to disregard the discussion schedule, opting to discuss each topic for approximately one week (Table 2), even if that meant that more than one topic was being discussed at the same time. Students participated in two discussions in week 1 (A and B), one in week 2 (C), two in week 3 (D and E), three in week 4 (F1, F2 and F3) and one in week 7 (G). Rather than curtailing their participation when topics were being conducted concurrently, the opposite appeared to be the case with Conference C having the briefest period of activity, while the longest was Conference F. The demands of course pacing and scheduling likely had some impact on the duration of the discussion, as would be true in any face-to-face classroom setting. It could also be argued that the wrap-up messages posted by the instructor may have served to curtail discussion. In several of the conferences (C, E, F1, F2, F3), however, these wrap-up messages were posted after active discussion had already ceased. Based on the distribution of days of active discussion, it would appear that, to some extent, participants are self-regulating with regard to the length of time that they devote to the discussion of any one topic.

Rates of participation

It would not be unreasonable to assume that if students were participating in more than one conference concurrently, they might reduce their level of participation in each conference, or, alternatively, if they were participating in only one discussion, they might make more frequent contributions. Based on the

aggregate number of messages posted in each week (Table 8), it appears that the number of concurrent conferences had little impact on the level of participation. The fewest messages were posted during a week when only one conference was underway, while the greatest numbers of messages were posted during the two weeks where two topics were being discussed concurrently.

Table 8. Messages Posted to Concurrent Discussions.

Conference	Each conference	# of concurrent sub-conferences	Concurrent conferences
A	51	6	91
B	40		
C	50	3	50
D	57	6	103
E	46		
F	62	3	62
G	59	4	59

Aggregate numbers are not really reflective of the students' experience, however, because they were not required to contribute to all the different subconferences. Table 9 shows the mean number of messages that were contributed to each subconference. This reflects the average number of messages each participant was exposed to because they did not remain in the same small groups throughout the course. It can be seen that there is no substantial difference between the number of messages posted to each small-group discussion. An increase in the number of concurrent discussions did not appear to lead to a reduction in the number of contributions made to each one.

Table 9. Average Number of Messages Posted

Conference	To sub-conference	Per participant	Per participant to concurrent conferences
A	17.0	3.0	5.4
B	13.3	2.4	
C	16.7	2.9	2.9
D	19.0	3.4	6.1
E	14.3	2.7	
F	20.7	3.6	3.6
G	14.8	3.5	3.5
M	16.7	3.1	4.3
SD	2.5	0.5	1.3

Initially, Conference F1, F2, and F3 were considered to be independent discussions, but upon further examination, it was determined that they were actually one and the same. Students' comments reflected the interconnected nature of these conferences, and indeed, expressed the opinion that they were virtually inseparable. In addition, this was the only time during the course when participants were expected to contribute to all of the subconferences (F1, F2, and F3). This stands in contrast to the small-group discussions where students participated in only one of the three or four subconferences. Because of this, Conference F was considered to be analogous to a large-group discussion. Because participants were exposed to the total of 62 messages posted to that discussion, that figure would seem to be more representative of the actual experience than would the average of 17 messages. The number of messages posted to conference F is also significantly higher than the 51 messages that would be expected for 3 small group discussions. From this, it can also be

inferred that the size of the group has a greater impact on the total number of messages posted than does the number of concurrent discussions. That is, 16 people discussing a topic as a single group will generate significantly more messages than they would if divided into small groups to conduct the discussion.

In addition to group participation, rates of individual participation were also analysed. It was found that several students chose to reply to several previous postings within the same message. For example, while one participant might post individual replies to each of four different messages (i.e., four messages result in four separate responses), another may reply to the same four messages in a single response. A decision had to be made as to whether the latter type of response should be counted as one message or four. It could be concluded that a count based on a software analysis resulted in a significant degree of under-reporting. Alternatively, using the software provides a reasonable estimate of overall participation, identifying 88% of student messages, 99% of instructor messages, and 90% of the total number of messages.

Female participants accounted for all but two of the multiple postings, so further analysis was undertaken to determine if the number of messages posted by male and female students was significantly different from what would be expected. Female students accounted for 75% of the student participants. Using a software count, they posted 74% of the messages, while they posted 76% of messages according to a surface count. Based on the results of a Chi-square test, this difference was not significant.

Extent of interaction

Neither the absolute number of messages posted, nor the number of messages posted by each participant is indicative of the extent of interaction between participants. The amount of interaction identified, however, can vary depending on the method used for identification. The interaction maps of Conference A2 that were presented in Figure 2 illustrated how an analysis of software linkages indicated that the majority of the messages were posted in isolation, neither generating any further discussion, nor furthering the discussion that had already taken place. This was true of 47 (61.8%) of the instructor's postings and 147 (49.7%) of the students' postings. Mapping surface cohesion (Figure 3) presented a somewhat different picture. While the number of isolated instructor postings remains about the same at 41 (59.4%), the number of isolated students messages is reduced to 82 (27.7%).

Although each message is identified as a discrete posting even if it contained a reply to more than one earlier message, mapping focuses on the relationships between messages, making the linkages obvious. It is clear that participants use surface cohesion strategies quite extensively. As noted earlier, the software cannot support multiple replies, so this could explain the reliance on surface links for those messages that responded to more than one earlier posting. It cannot account for those cases where participants chose to use surface cohesion *instead* of the reply function. Nor does it explain why so many participants used

surface links in *addition* to the reply function. This redundancy was found in 65 (17.8%) of the messages posted.

It would also appear from the software generated links that the messages posted by the instructor did not overtly control the direction taken by the group's participants. The instructor initiated fewer discussion threads than did students as a group, as measured by both software analysis (instructor initiated 13 threads, students 55 threads) and surface analysis (instructor 16 threads and students 37 threads). Students used software links to reply directly to the instructor only six times throughout the course. They used surface cohesion strategies to refer to the initial posting 53 times, but while this was a marked increase over software cohesion, it still reinforces the impression that students established the direction of the discussion. Nor did subsequent messages posted by the instructor result in a large number of student responses according to either software or surface markers (11 and 7 respectively). Instructor-to-student interaction was not extensive, with the instructor using the reply function only 9 times, and surface cohesion 14 times. Learner-learner interaction made up the bulk of the communication. Students used the reply function to respond to other students 75 times and used surface links 143 times. The extent of learner-learner interaction identified in these two analyses reinforces the belief that learners exercise more control over the direction of on-line discussions, and this is further supported by the relative number of threads initiated by instructors and learners.

This view of the learner-directed on-line learning environment, however, is not supported by a lexical analysis of the interaction. While mapping the software and surface markers helped to clarify interaction patterns, mapping lexical cohesion initially obscured instances of learner-learner and instructor-learner communication. This was due to the predominant role played by the instructor's initial posting. Rather than generating six software links or 53 surface links, it appears from the analysis of lexical markers, that students made 238 references to the instructor's initial postings. The instructor also linked to the initial message in 37 later postings.

Characteristics of interaction

The lexical analysis also contradicted the impression, based on the number of isolated messages identified in earlier analyses as well as the number of discussion threads introduced, that the discussions were somewhat disjointed and relatively wide-ranging. From a lexical standpoint, very few of the messages were isolated. Only two instructor postings and five student postings did not link to another message. In addition, the number of discussion threads was fewer than that indicated by either the software or surface analysis. The instructor initiated 23 threads (22 of them in the form of the initial posting), while students as a group initiated only four new threads. This is not to minimise the extent of learner-learner interaction, however. Students lexically linked their messages to those of other learners 227 times--considerably more frequently than they used either the reply function (75 times) or surface cohesion (143 times). These two

factors (few threads, few isolated messages) present a picture of a cohesive, focussed discussion, and further reinforce the importance of the instructor's role in the interaction. At the same time, however, the preponderance of two-message exchanges indicates that the instructor is not controlling the discussion in the same way as is typical of a face-to-face classroom. The Initiate, Response, Follow-up (IRF) pattern typical of face-to-face interaction (Dillon, 1994; Dobson, 1995; Sinclair & Coulthard, 1975) is not the norm in the asynchronous context, and when it does occur, the three-part exchange is much more likely to be a student-student interaction rather than an instructor-student interaction.

Lexical links were more essential to the process of pulling together ideas from previously posted messages than were surface links. This was especially true for the way the instructor chose to summarize the discussion. From the perspective of surface cohesion, it appeared that the instructor posted only one of the weaving or summarizing types of messages that are considered by many to be essential to the success of text-based interaction. The lexical analysis contradicted this impression, showing that the instructor posted this type of message to every conference and most sub-conferences, most frequently using them to redirect or refocus the discussion. This is not to say that the instructor is solely responsible for making this type of contribution. Students posted many such messages. Female students in particular used both types of strategies to tie together multiple messages. For male students, however, this was an exception, because they rarely addressed more than one prior message per posting.

Lexical links that tie to more than one previously posted message also tend to contradict Hewitt's (1997) assertion that participants do not refer to earlier messages because this type of interaction is not supported by the software, and that this results in increasingly fragmented discussions that suffer from conversational or topic drift. Nor were participants limited in their interactions by an inability to use the software to reply to more than one message, choosing instead to adapt face-to-face communication strategies to meet their needs. These same strategies were used by participants to keep in the forefront topics and ideas that were posted earlier in the discussion, at the same time as they incorporated recent contributions into the developing discussion. These results would appear to repudiate the importance of the recency effect (Graebner, 1998) in asynchronous discussion.

Conclusions

The conclusions of this study can be grouped into three categories. The first relates to the suitability of each of the analytical methods to accurately assess interaction that takes place in the on-line learning environment. The second is concerned with the adaptive strategies used to maintain cohesion in text-based interaction. The third addresses the nature of interaction in the on-line environment.

Analytical Methods

Each of the three analytical methods, software, surface and lexical cohesion analysis, is associated with a cohesive strategy, and each provides the researcher or instructor with a different view of the on-line interaction taking place. No one method when used in isolation will provide a complete picture, however time and effort must be weighed against the outcomes. For the most part, software cohesion analysis, while relatively easy to accomplish, did not represent the interactions with any degree of accuracy. Relying on the information gleaned from subject lines and other software features led to under-reporting the participation of individuals, the extent of interaction, and the impact of the instructor's messages while, at the same time, it over-reported the duration of discussions, the number of discussion threads and the number of isolated messages. Surface cohesion analysis provided a more accurate measure of both the duration of discussions and individual participation, but it also over-reported the number of new threads and isolated messages. Nor did it identify the importance of the initial instructor message in organising the discussion. The analysis of lexical cohesion provided the most detail about how the discussions were structured, the relationship between the individual messages, and the development of the discussion, but was not helpful in determining either the duration of the discussion or the extent of individual participation. When used in conjunction, surface and lexical cohesion analytical methods complement each other and provide a clearer picture of the cohesive strategies used by participants.

Adapting Strategies to Maintain Cohesion

Participants did not choose one cohesive strategy over another. Rather, they use all three strategies in combination to maintain cohesion in on-line discussions. Lexical ties are the most extensively used means of maintaining a cohesive discussion, just as is the case in face-to-face interaction. While such linguistic features as reiteration are implicit in oral speech, in text-based interaction, it appears that these lexical ties are somewhat more explicit. This added explicitness seems to signal a communicative adaptation. Surface ties such as adhesion and extensive naming help participants to follow the thread of a discussion by highlighting the comment being addressed and its author. This device is used in more formal face-to-face interaction and its use within a less formal environment indicates another level of adaptation. On their own, these surface strategies provide a reasonable degree of cohesion, but when used in conjunction with the lexical ties they serve to reinforce the narrative thread of the interaction. The cohesion afforded by software features is perhaps the most tenuous of all. Participants' use of the reply function to maintain a cohesive discussion appears to be limited to that of a supporting role. Rather than controlling the degree of cohesion (Hewitt, 1997; Pincas, 1998), software features serve more as a backup. This is no doubt largely due to the inability of the software to support the simultaneous responses to multiple messages that are a feature of a cohesive discussion conducted in an on-line environment. Nor does

this strategy have a counterpart in face-to-face interaction, which may also be an inhibiting factor in its use in the text-based context.

Nature of interaction

Although the question of the optimum amount of time to allow for a discussion has not been resolved, students in this course self-regulated the duration of their interaction. Both large- and small-group discussions lasted for approximately one week, with the level of activity in each discussion group remaining fairly constant regardless of the number of concurrent discussions. It is yet to be determined if the same degree of self-regulation exists in discussions that have been scheduled for periods longer than one week. In situations where a longer time period has been allocated for discussing a topic, an instructor may wish to be alert for signs of self-regulation and determine if diminished activity levels indicate a need to stimulate the discussion.

Two factors appear to influence rates of participation. The first is whether postings are used to link to multiple previously posted messages or to a single message. Because not all participants use multiple replies to the same extent, it is possible that this could be a factor in those cases where a student receives a participation mark based on the number of contributions they make to the on-line discussion. The size of the group also appears to have a bearing on the extent of participation. A higher rate of participation was found in large versus small group discussions. In situations where information overload is a concern, for example, if the class size is very large, if the time frame is relatively short, or if a group of

students is particularly verbose, an instructor might consider limiting group size by creating a series of small discussion conferences. Further exploration of this topic could help determine the optimum group size for various circumstances.

Topic cohesion was maintained through a variety of means. The instructor's initial posting played a predominant role in organising the discussion. Discussion centred on the assigned topic with very little off-topic discussion, and there was no evidence of either topic drift or fragmentation. The tendency for participants to link to the immediately preceding message was mitigated by the frequency with which they linked to an earlier posting within the same message. Participants who opted to respond to several previous postings within one message filled the role of 'weaver' by pulling several ideas together. Further research is needed to determine whether the observed disparity between female and male participants in contributing this type of message is a characteristic of their respective communication styles in an on-line context. The cohesiveness of the interaction was likely influenced by the course structure where a conference was created for each topic, where small rather than large-group discussions were the norm, and where discussions were limited in duration.

While the limited number of discussion threads and relatively few isolated messages contributed to the impression of a cohesive interaction, the abbreviated nature of the majority of exchanges raises several questions that would serve as the basis for further research. Although it is evident that the classic classroom Initiate, Response, Follow-up interaction pattern is not the norm in the on-line

environment, further study is needed to determine if this pattern has been replaced by another. Additional analysis might also identify factors underlying those exchanges that extended over many messages and the ways in which they differ from the abbreviated exchanges.

In conclusion, it is evident that participants have adapted their communicative strategies and combined those strategies to maintain a cohesive discussion. Elements of instructional design, especially the creation of a number of topic-specific small group discussions, appear to have an impact on the extent of interaction and to support the development of cohesive discussion. Just as with face-to-face interaction, lexical ties form the basis of a coherent and cohesive discussion. Adhesive features such as quoting, which are typical of surface links, are used more extensively on-line than they are in face-to-face interaction. The threading features of the software are used less extensively than might be expected--certainly much less than were the lexical and surface cohesion strategies. Not all analytical methods, however, are equal in their ability to reveal the extent and complexity of cohesive on-line interaction.

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Preface to Paper 2

Characteristics of Teacher Talk and Learner Talk in an On-line Environment

In the second part of this study, I was interested in discovering if instructor speech in this on-line environment was similar to the "teacher talk" that occurs in face-to-face classrooms. I also wanted to determine if there were certain features that were more representative of the way learners talk. I chose to use a speech act analysis, largely because there is a precedent for using this method in the face-to-face classroom (Sinclair & Coulthard, 1975), in ordinary conversation (Stenström, 1994) and, more recently, in on-line interaction (Harrison, 1998). This seemed to be a logical progression, and one that offered the possibility for comparing the speech identified in those environments with that observed in this on-line context.

As was the case in Chapter 2, I have used statistics only for the purpose of identifying general characteristics of the interaction. Although it would have been possible to use more sophisticated statistical methods, this could have given the impression that speech act analysis is an exact science. It is far from that. This is because language is essentially subjective in nature. Total objectivity is impossible because language is inherently context-bound. That is one of the reasons why analyses of speech acts do not provide information about such things as inter-rater reliability—the analysis is not complete until a consensus has been

reached. The role of the researcher takes on greater importance, because his or her familiarity with the context is key to the analysis.

Having said that, there were still situations were I could not determine with any degree of confidence which category of speech act was most descriptive of an utterance. For instance, an expansion is a type of speech act. Two other types are justifications and examples. Sometimes an example was used to justify the speaker's position or to expand upon something previously said. This linguistic complexity has long been acknowledged, and there is a strategy for dealing with such conflicts (Sinclair & Brazil, 1983; Sinclair & Coulthard, 1975). This calls for potentially ambiguous categories to be joined into a single category until that category can account for all the conflicts. In this case, all three of these speech acts were collapsed into a single category called a comment. All acts in this category were comments on something the speakers had themselves already said.

Finally, when I was examining the exchange structures in this on-line interaction, I thought it might be useful to determine if there were some interaction patterns that could help to explain the preponderance of two-person, two-move exchange patterns that I identified in the previous study. To that end, I performed a simple social network analysis (Wasserman & Faust, 1994) by charting each time a participant responded to another individual's utterance (Table 1). So, for example, student 1 posted ten responses, seven of which were to messages posted by the instructor.

Table 1: Social Network Analysis

	st 1	st 2	st 3	st 4	st 5	st 6	st 7	st 8	st 9	st 10	st 11	st 12	st 13	st 14	st 15	st 16	instructor	sent	per cent to instructor
st 1		0	0	1	0	0	0	0	1	1	0	0	0	0	0	0	7	10	70%
st 2	3		3	6	0	3	0	0	0	0	0	0	0	0	0	0	8	23	35%
st 3	5	3		5	0	4	0	3	0	1	1	3	1	3	0	0	3	32	5%
st 4	0	2	7		1	0	0	2	5	0	0	0	0	1	0	0	1	19	5%
st 5	1	0	0	1		4	2	0	1	4	0	0	0	0	1	0	15	29	52%
st 6	1	2	0	0	5		2	1	1	1	0	1	2	0	0	0	3	19	16%
st 7	1	0	0	0	1	2		0	0	0	0	1	0	2	0	0	1	8	13%
st 8	2	1	0	2	4	1	2		4	3	0	2	0	0	0	0	8	29	28%
st 9	1	0	3	2	2	1	0	5		0	0	0	0	1	0	1	2	18	11%
st 10	0	0	2	0	0	1	0	1	0		1	1	0	0	0	0	8	14	57%
st 11	1	1	0	0	1	0	0	3	0	1		2	2	0	4	1	1	17	6%
st 12	0	0	2	0	0	0	2	0	0	1	0		0	0	0	0	5	10	50%
st 13	0	0	0	0	0	2	0	0	0	0	0	0		0	0	0	4	6	67%
st 14	0	0	2	1	0	0	1	0	1	1	1	0	0		0	0	5	12	42%
st 15	2	1	0	0	1	1	0	0	0	0	2	0	0	2		0	11	20	55%
st 16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		5	5	100%
instructor	0	0	2	1	0	1	1	4	0	0	0	0	0	4	0	1		14	
received	17	10	21	19	15	20	10	19	13	13	5	10	5	13	5	3	87	285	0%

This analysis reveals that some students exhibit a marked preference for interacting with the instructor rather than with other students. For example, student 16 interacted only with the instructor, and over two-thirds of the exchanges in which students 1 and 13 participated were instructor-student interactions. While one would expect that students would respond to the instructor's messages, it is notable that seven of the sixteen students directed at least half of their responses to the instructor's messages. Since the instructor posted only 14 direct responses to students' messages, choosing more often to respond to the group, this could explain the shift from the two-person, three-part exchanges observed in face-to-face classrooms (Sinclair & Brazil; 1983; Sinclair & Coulthard, 1975).

I have discussed this exchange structure at greater length in the paper, but because the focus of the paper is on speech acts, the inclusion of the social network analysis was inappropriate. I have included it here because it is pertinent to, and can further illuminate, the subject of participant interaction.

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Characteristics of Teacher Talk and Learner Talk in the On-line Learning Environment

Introduction

Most classroom time is filled with spoken language. Teachers continuously engage in organising, explaining, summarising, reformulating and redirecting what has been said both by themselves and by students. As a result of these activities, teachers contribute two-thirds of classroom talk (Dillon, 1994; Graddol, 1989), which means that they tend to dominate the interaction. According to Flanders (1970), of the 10,000 hours that children spend in the classroom, 70% of the time someone is talking, and the teacher talks for 70% of that time. Nor is teacher dominance of interaction limited to primary or secondary education. At the post-secondary level, Hillman (1999) found that the instructor produced 73% of the sentences uttered. More than content is conveyed through teacher-talk. These thousands of hours of exposure also work to establish a set of communicative norms specific to the classroom environment.

While this model of classroom interaction is still descriptive of many classroom environments, within the realm of adult education more apparently egalitarian models based on principles of adult learning have replaced the teacher-controlled interaction. In this type of environment, it is proposed that the

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A version of this paper is in review. *Educational Telecommunications.*

communicative model might more closely resemble the apparently unstructured form that conversation takes outside the classroom. In fact, conversational analysis indicates that such exchanges are highly structured, but structured differently than in the traditional classroom model; in the peer group model, it is up to the participants to maintain order (through turn-taking mechanisms), maintain cohesion, and request clarification (Graddol, 1989; Sprague, 1993). This arrangement removes instructors from the centre of communicative exchanges. After a lifetime of being socialized in classrooms where the teacher does most of the work in the form of organising discourse, eliciting participation and anticipating questions, some students resist assuming responsibility for taking a more active role in classroom interaction (Wells, 1994).

Established classroom communication norms were not challenged by traditional print-based distance education because interaction between instructors and learners was highly circumscribed. With the introduction of text-based communication technology into the distance education environment, this situation has changed. Computer-mediated communication has increased the potential for interaction, and at the same time, it has created the need to learn new ways to use language; the communicative strategies that instructors and students have been socialised to in the face-to-face setting are not always adequate in the on-line context.

The three purposes of this study were to:

1. identify the context-specific linguistic strategies (speech acts) used by

participants in a graduate level on-line learning environment;

2. determine how instructors and learners use language to organise, direct and facilitate communication--in effect, to discover the nature of "teacher talk" and "learner talk" in this text-based asynchronous environment; and
3. identify the interactive structure of the asynchronous text-based educational context.

Issues arising from the research relate to the ways that communicative strategies used by instructors and students affect teacher-learner and learner-learner interaction, as well as the evolution of class interaction.

Conceptual Framework

Sinclair and Coulthard (1975) created a system of speech acts, moves, turns, exchanges and transactions to describe the interaction that takes place between the teacher and students. Stenström (1994) built upon this system by incorporating more recent research and applying it to everyday conversation, which is a less predictable communicative event than that described by Sinclair and Coulthard. This is relevant to the study of interaction in an adult education environment where there are different expectations of student participation in discussion. Harrison (1998) used both of these works in her analysis of the asynchronous text-based interaction of an e-mail listserv.

For this study, a synthesis of these three works was developed. The result is a framework for the analysis of a conversational type of discourse, set within an educational context, in an asynchronous, text-based environment. This framework

also ensures conceptual consistency. That is, the meaning of acts, moves, et cetera is constant. This is important because other linguistic theorists (Austin, 1962; Bellack et al., 1966; Searle, 1969) have used the term "speech act" to refer to the illocutionary function of an utterance. This is quite different fiom the speech act that forms one tier of the hierarchical structure that will be described below.

The Study

The 17 subjects in this study are participants of a graduate degree program that uses computer conferencing to facilitate interaction. The transcripts of their on-line interactions, conducted over a period of eight weeks, consist of 552 messages distributed among 27 subconferences. From these messages, 350 were selected for analysis. These messages were posted in seven topic conferences, which were further divided into 22 small-group discussion conferences. These discussions were conducted entirely on-line. Discussions that comprised a combination of on-line, video, audio, and face-to-face interaction were excluded from the analysis.

This sample is representative of interaction within a specific computer-mediated context. Because this course was offered approximately midway through a program of study, this cohort of students was familiar with the communications technology being used (FirstClass Client). The students had also had time to become familiar with the text-based asynchronous learning environment and to establish a set of communicative norms. The role of communications technology was limited to facilitating participant interaction.

That is, the course itself did not pertain to distance education, computer-mediated communication, or any other technology. Participation in the on-line discussions was ungraded, and there were no constraints on quantity or length of contributions.

System of Interaction

The system of interaction as described by Sinclair and Coulthard (1975) comprised five discourse categories: act, move, exchange, transaction, and lesson. "Lesson," however, is less a linguistic category than it is a sociological category that is dependent on the context of the interaction (Brown & Yule, 1983). When Stenström (1994) revised this hierarchical structure in order to represent conversational interaction, she removed the superordinate category of lesson and also inserted an additional category—turns. As illustrated in the schematic of Stenström's system of interaction (Figure 1), the hierarchical levels are act, move, turn, exchange, and transaction.

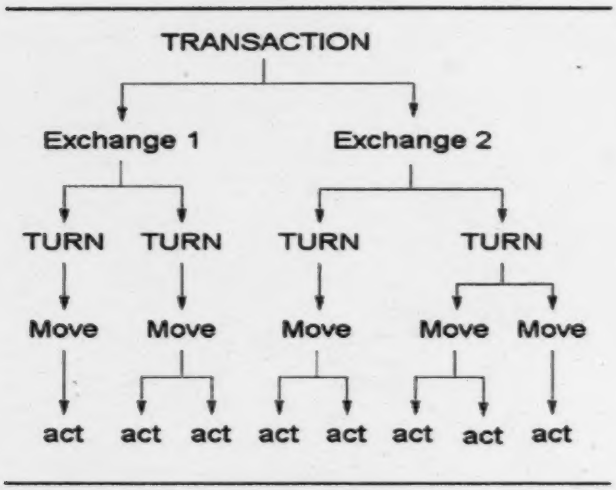

Figure 1: Interactional Structure (Stenström, 1994)

Briefly, an **act** is the smallest communicative unit. There are many different types of acts, but some, such as questions and answers, are more common than others. The next level in the hierarchy is a **move**. A simple move can consist of a single act, but several acts may be combined to form a complex move. An example of a move frequently used by educators is one that provides feedback. Such a move may be accomplished with a single move (e.g., "Yes" or "No"), while a more complex move might be made up of several acts (e.g., "Yes. That's the correct answer.").

A **turn** is everything one speaker says before the next speaker begins; it forms the next hierarchical level. A speaker may make one or more moves during their turn. If the teacher were to say "Yes, that's the correct answer. How did you arrive at it?" that would be a single turn made up of two moves. The first

provides feedback and the second initiates a new exchange. An **exchange** is the smallest interactive unit so it requires the participation of two different speakers. Each must make at least one move. When a teacher asks a question and a student responds, that interaction forms an exchange. A **transaction** is the highest level, and it comprises one or more exchanges, all on the same topic. A change of topic signals the beginning of a new transaction, although it does not necessitate a change of speakers. A simple transaction consisting of one exchange is shown in Figure 2.

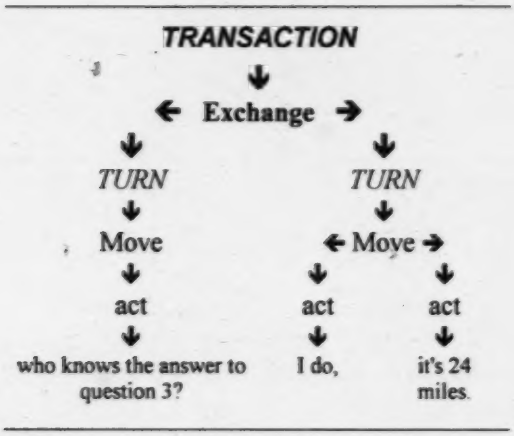

Figure 2: Schematic of a simple transaction.

Acts

Acts are the first level of linguistic strategies used in communication. Stenström (1994) identified 45 acts, in three categories, that are used in face-to-face conversations (Table 1). Harrison (1998) found 39 of them in her analysis of the listserv. The exceptions were *acknowledge*, *call-off*, *closer*, *reject*, *clue* and

staller[1]. Since written text makes use of a more limited range of acts, she concluded that the variety of acts indicated that e-mail closely resembles spoken discourse. In the present study, instances of all but *reject* were identified. This difference may be related to sample size since Harrison's study consisted of just 12 messages.

Table 1: Speech Acts (Stenström, 1994)

Categories	Acts			
Primary	accept	check	invite	reject
	acknowledge	closer	object	reply
	agree	confirm	offer	request
	alert	disagree	opine	smoother
	answer	evaluate	query	statement
	apology	greeting	question	suggest
	call-off	inform	react	thanks
Secondary	clue	expand	metacomment	preface
	emphasizer	justify	precursor	
Complementary	appealer	filler	monitor	starter
	booster	frame	staller	uptake
	empathizer	hedge		

These 45 acts, however, did not account for some of the acts identified in either Harrison's or the present study. Harrison added the act of *quotation*. By this, she was referring to the common practice of pasting a portion of the text from an earlier message into the current one. I found it necessary to introduce three acts, *example*, *nominate*, and *rhetoric?*, all of which were identified by Sinclair and Coulthard (1975). A fourth act, *title*, was required to account for the use of titles, bullets and numbering to organise contributions. As with *quotation*,

title is context specific and the use of either in face-to-face conversation would be unusual.

After all the acts were identified, they were subjected to a process of reduction. Following the recommendation of Sinclair and Coulthard, several acts were collapsed into one, with function being the determining factor. To illustrate, *justify, example*, and *expand* serve to augment the primary act, so they were collapsed into the act *comment*, while *question* and *rhetoric?* could not be collapsed into a single category because they serve different functions (p. 11).

This collapsing of categories also served to resolve a methodological problem. It was occasionally difficult to determine exactly which act (or move) most accurately described the communication. Language is complex, and a single utterance may serve more than one purpose. By collapsing the categories, all the utterances could be accounted for, without the need to make arbitrary decisions.

Although the categories of primary, secondary and complementary acts as used by Stenström (1994) are relevant to the linearity of utterances produced in real-time speech, they are not representative of the embedded nature of asynchronous constructions. In order to examine the distribution of context-specific linguistic strategies more closely, the acts were categorized as either interactive, organisational or content-related acts (Table 2). This arrangement helps to highlight how participants used these acts strategically within the asynchronous environment.

Table 2: Distribution of Speech Acts

	# of Acts			% of Act*	% of Total Acts	
Acts	**Instructor**	**Class**	**Total**	**Instructor**	**Instructor**	**Class**
Interactive						
meta	15	191	206	7.28	0.24	3.07
empathise	14	95	109	12.84	0.22	1.53
greet	93	154	247	37.65	1.49	2.47
nominate	15	156	171	8.77	0.24	2.51
appeal	2	36	38	5.26	0.03	0.58
	139	632	771	18.03	2.23	10.15
Organisational						
direct	41	9	50	82.00	0.66	0.14
frame	27	278	305	8.85	0.43	4.47
quote	90	472	562	16.01	1.45	7.58
	158	759	917	17.23	2.54	12.19
Content-related						
opine	12	563	575	2.09	0.19	9.04
state	59	1160	1219	4.84	0.95	18.63
inform	48	489	537	8.94	0.77	7.86
comment	108	1421	1529	7.06	1.73	22.83
answer	0	40	40	0	0.00	0.64
agree	12	119	131	9.16	0.19	1.91
question	44	96	140	31.43	0.71	1.54
rhetoric?	27	184	211	12.80	0.43	2.96
suggest	3	26	29	10.34	0.05	0.42
evaluate	95	31	126	75.4	1.53	0.50
	408	4129	4537	8.99	6.55	66.33
n=6225	705	5520		11.33	11.33	88.67

** % of each type of act contributed by the instructor*

When viewed in this way, two general trends become evident. First, more acts are related to content than to either interaction or organisation. This is true for both the instructor and students. Second, the instructor posted only 11% of the 6225 acts identified. When this number is compared with either the 81% (Flanders, 1970) or the 70% (Hillman, 1999) cited for face-to-face interaction, it is safe to say that the instructor does not dominate the interaction. Closer

examination reveals that there are specific exceptions to both of these generalisations. There are also some qualitative differences in the form of several of the acts depending on whether they are uttered by the instructor or a student.

Interactive Acts

Participants used a full range of interactive acts. They talked about their talk (*meta*), they apologized and thanked each other (*empathize*), they greeted each other (*greet*), they addressed each other by name (*nominate*), and they asked for feedback (*appeal*). The most frequently used interactive act was *meta.* Students, in particular, tended to comment on the grammatical construction of their contributions ("That's written awkwardly") or on specific features of their writing ("Metaphor alert!"). In the face-to-face classroom, *nominate* is used by the instructor to identify the pupil from whom a response is desired. On-line, it is used by all participants and would appear to compensate for a lack of eye contact. It may also serve to elicit a response. Harrison (1999) noted that requests addressed to the group as a whole tended to be ignored. The instructor used *greet* far more often than did the students. She started and ended each of her messages (other than the initial message where the group task and topic were introduced) with some type of greeting. Students' use of greeting was more variable with some students always using a greeting and some never, while others conformed with the dominant pattern of the group in which they were participating at the time. Students made use of *appeal* to an extent that would be unusual in face-to-face classes where they rarely need to ask for a response, since these are generally

forthcoming, either from the instructor or other student. On the occasions where the instructor used an *appeal*, they were similar to those in a face-to-face classroom ("What do you think of this?"), while students were often more explicit in the requests for feedback. This was particularly evident in situations where there was an extended discussion of differing views ("It will not hurt my feelings if you disagree with my ideas.").

Organisational Acts

Organisational acts can be divided into two categories—those that organise activity and those that organise speech. As in the traditional setting, the instructor was almost entirely responsible for acts that direct activity. This would include such instances as when the instructor requests students to discuss a particular topic. Students, however, frequently use speech-organising acts. There is little difference in the type of *frame*s used in conversation and those used on-line. What is different is their placement. A *frame* marks a discourse boundary and, as such, signals that something will follow. Unlike speech produced in real-time, asynchronous utterances are less linear, and frames are frequently embedded within other acts. In this respect, on-line communication more closely resembles writing than it does speech. As described earlier, *quote* is a context specific act and includes not only blocks of material pasted in from earlier messages, but also features more typical of written communication such as titles, numbering, and bullets.

Content-related Acts

Most of the acts uttered by both the instructor and the students related to content. While ordinary conversation serves a primarily interactional function (Brown & Yule, 1983), the large number of transactional, or content-related, acts compared with interactional acts is typical of an educational context. The students discussed the topics at length with the predominant acts being *opine* (students provided 98%), *state* (95%), *inform* (91%), and *comment* (93%). These are acts for which the teacher would be responsible in most traditional classrooms (Sinclair & Brazil, 1982). One type of *inform* stood out as being notably context specific. It is not unusual for a student in a face-to-face seminar to refer to an assigned reading or some other authority as part of their turn. Students in the asynchronous text-based context, when making this same type of reference, would frequently provide a complete citation to the source of the information. They may do this because they perceive that their contribution is being viewed more critically than it would be in a verbal setting (Blanchette, 1999). Because of the permanence of the medium, students may see these citations as necessary in order to avoid any intimation of plagiarism. This situation would be unlikely to arise in the give and take of an oral discussion. The *comment* act refers to the various ways that participants added information to an act. This includes *precursor*s, *expansion*s, and *justification*s to name a few. It is not a comment on an utterance made by another participant, but rather, builds upon the speaker's own utterance.

Students also provided 100% of the *answers*. An *answer* is a brief reply to a *question* pasted into the body of the message. For example, in reply to the *question* "Is this theory relevant to your work?" a student might enter the single-word response, "No." This act did not appear frequently and accounted for less than 1% of the total. Students also contributed 91% of *agree*, which includes disagreeing. A common strategy was to express agreement with some aspect of the previous message, before stating their differing views. The instructor asked 31% of the *questions* but only 13% of the *rhetoric?*. Within traditional classrooms, the use of rhetorical questions is generally restricted to the instructor, except during such activities as formal debates (Sinclair & Coulthard, 1975). Since rhetorical questions are considered by some to be statements framed in a question format (Davis & Brewer, 1997), the *rhetoric?* act is closely aligned to the *opine*, *state* and *inform* acts.

With the exception of *direct*, *evaluate* is the only occurrence of an act where the instructor contributed more than the class as a whole. The instructor provided 75% of the evaluative acts. When students did make an evaluative remark, they tended to be of the "Good point" or "Interesting argument" variety. These were always directed toward other members of the class. Students never made evaluative comments about instructor contributions.

Moves

Moves comprise the second level of linguistic strategies used in communication. A move may consist of a single act, or it may be more complex.

For example, an *answer* may form a complete *Response.* Alternatively, a *Response* to an offer made by one student, "Would you like me to submit the assignment." consisted of an *accept*, *thanks*, *comment* sequence: "Yes, thanks, since I'll be away for the next 2 days." Stenström identified eight moves in conversational interaction: *Summons*, *Focus*, *Initiate*, *Repair*, *Response*, *Re-open*, *Follow-up*, and *Backchannel*. Only six of these were applicable in this asynchronous text-based context. Neither *Re-open* nor *Back-channel* --those verbal and non-verbal signals such as the murmurs and nods that the listener uses to signal that they are paying attention--were identified. As was the case with acts, the six remaining moves did not completely account for the moves used by participants in the on-line learning environment. Four types of move were added for a total of ten (Table 3). These additions are context-related, but the adult post-secondary context is as much a factor as the asynchronous text-based communication context. The instructor contributed approximately the same percentage of moves as acts—16% vs. 13%. Again, there were qualitative differences in the ways that instructors and students used these moves.

Table 3: Distribution of Conversational Moves

Moves	# of Moves			% of Moves*	% of Total Moves	
	Instructor	Class	Total	Instructor	Instructor	Class
Interactive						
Phatic	0	29	29	0	0	2.24
Summons	39	92	131	29.77	3.02	7.12
Signoff	41	115	156	26.28	3.17	8.90
	80	236	316	25.32	6.19	18.27
Organisational						
Repair	4	0	4	100	0.31	0
	4	0	4	100	0.31	0
Content-related						
Focus	14	169	183	7.65	1.08	13.08
Initiate	47	96	143	32.87	3.64	7.43
Response	11	200	211	5.21	0.85	15.48
Follow-up	49	75	124	39.52	3.79	5.80
Exposit	3	216	219	1.37	0.23	16.72
Narrative	0	92	92	00	0	7.12
	124	848	972	12.76	9.6	65.63
n=1292	208	1084		16.10	16.10	83.90

Organisational and Interactive Moves

The instructor is the only one who used the single organisational move *Repair*, intervening as soon as it became evident that students had misunderstood the instructions. It was necessary to add two new moves in order to accurately represent the interactive moves used on-line interaction. The first, *Phatic*, is a context-setting or context-sharing move. Students contributed all of the *Phatic* moves. An example is "I'm sitting in my office, looking out the window on this beautiful sunny day." This type of move is unnecessary in a face-to-face classroom since, just by virtue of being in the same room, students are sharing a context. *Summons* is one of Stenström's moves but it is used more extensively on-line than in oral conversation. Coupled with a new move, *Sign-off*, it serves to

compensate for a lack of eye contact and other paralinguistic cues. This is not to say that these moves are not used in verbal conversation: speakers greet each other and say goodbye in a number of different ways. But they do not do it at the beginning and end of each turn. In this way, on-line interaction resembles the behaviour of radio operators or air traffic controllers. But while those groups use these moves to facilitate turn-taking, it is likely that students used them to add an interpersonal aspect to their communication. Their use may also be associated with the norms developed within other types of text-based interaction in the form of notes, memos and letters.

Content-related Moves

Focus, *Initiate*, *Response* and *Follow-up* are the moves most commonly associated with classroom interaction. In the face-to-face context the instructor is responsible for *Focus*, *Initiate* and *Follow-up* moves, while students' contributions are limited to *Response* (Sinclair & Brazil, 1982; Sinclair & Coulthard, 1975). In the on-line learning environment, students provided 92% of the *Focus* moves. *Focus*ing, whether reiterating or paraphrasing parts of earlier messages or using a heading as an introduction, facilitated the maintenance of cohesion in an asynchronous discussion. The instructor continued to take an initiating role on-line, although students contributed two-thirds of the *Initiates*—a much greater proportion than they would in a traditional classroom. In spite of this, the instructor made the primary *Initiates*, the ones that set the topics for the discussions.

While students contributed 95% of the *Responses*, most of these (61%) were to other students rather than to the instructor (39%). The students also contribute the majority (60%) of the *Follow-up* moves. Again, almost all (89%) were in reaction to moves made by other students. Student *Follow-ups* to the instructor tended to be in the nature of *thanks*. One particular type of *Follow-up* is worthy of mention. This is the *Summary*. The instructor not only used *Summary* more often—20% of her *Follow-ups* took this form compared to 7% of students'—but the moves were qualitatively different as well. Students' *Summary* moves were compilations of earlier contributions, usually made by quoting the earlier remarks and frequently naming the individual contributors. The instructor, on the other hand, presented a synthesis of earlier contributions, reformulating rather than quoting material, and only rarely identified the contributors.

Two new classes of moves, *Exposit* and *Narrative*, were also introduced. Students contributed these moves almost exclusively with the instructor providing only 1% of the *Exposits* and none of the *Narrative*. Together, these two categories comprised almost 25% of the total moves. Although both types of move contained large numbers of the *opine, state, inform*, and *comment* acts, they appeared to fill different functions. *Exposit* resembled formal rhetoric, and *Narrative* was akin to story-telling. When taken together, these two moves have the function of lecture, and it is possible that analyses of other on-line courses could see them being combined into a single move.

Turns

Turns comprise the third level of the interactive structure. One complication that arises when discussing turns in the text-based asynchronous context is that the terms "turn" and "message" are often used interchangeably. The difficulty is that a "message" is an artifact of the technology rather than a functional linguistic category so, from the perspective of speech act analysis, they are not one and the same. A further complication is that in face-to-face interaction, conversational norms constrain speakers to few acts and moves per turn. This proves to be problematic in asynchronous communication, however, where the time between turns can be measured in hours or days rather than in fractions of a second. Adhering to the conversational norms that govern face-to-face interaction would result in even simple asynchronous conversations extending over an inordinate amount of time. Identifying turns in these situations, where the contents of a message more or less equal what would be found in a face-to-face turn, is relatively straightforward. It is more difficult in those situations where participants take more than one "turn" at a time--something that cannot easily be done in synchronous discussions. In these instances, equating the number of messages with the number of turns leads to under-reporting of the latter. For example, in one of the conferences analyzed, Conference A2, 16 messages were posted, but an examination of the contents of those messages identified 21 turns.

Exchanges

An exchange is the smallest unit of communicative interaction. It comprises a series or sequence of moves made by more than one speaker. For example, an *Initiate* move made by one person and followed by a *Response* from another would constitute an exchange. Because exchanges require the involvement of more than one contributor, they are subject to the conversational norms that govern turns. As is true for turns, identifying exchanges based on software characteristics, while a common practice, provides an incomplete picture of the nature of on-line exchanges.

Turning again to Conference A2 as an example, the logs of threaded discussion were used to create the map of messages posted (Figure 3). The lines indicate the links between messages, or exchanges, as determined by the "reply" function of the software.

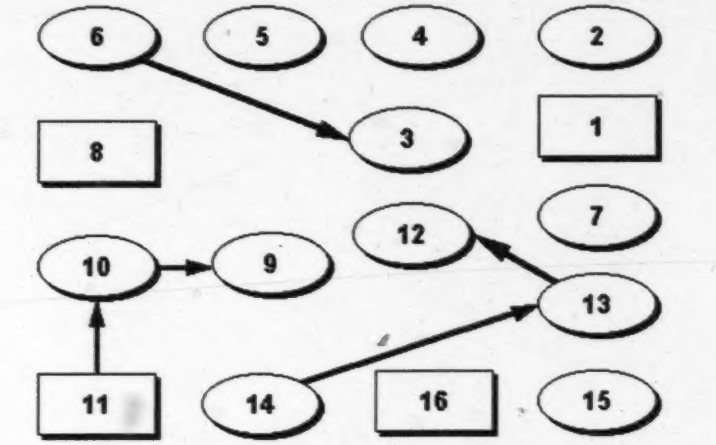

Figure 3: Message Map of Exchanges as Determined by Software Characteristics - Conference A2 (*Numbers indicate the sequence in which messages were posted, with #1 being the first message posted. Ovals indicate students' messages. Rectangles indicate instructor's messages. Arrows indicate exchanges.*)

Then the speech acts in each of these messages were identified and grouped into moves. These moves were linked by function. For example, each *Response* was linked to the corresponding *Initiate*. The resulting map is show in Figure 4.

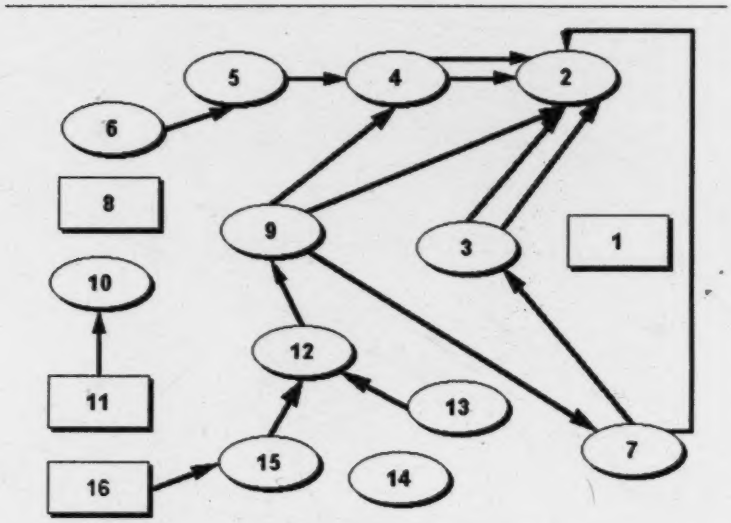

Figure 4: Message Map of Exchanges as Determined by Speech Acts and Moves - Conference A2

These two maps highlight both quantitative and qualitative differences in the exchange structures identified using each method. Not only does the message map shown in Figure 3 show more interaction (16 exchanges compared to five), it also calls attention to the fact that the exchange structure is both more extended and more complex.

The most common type of exchange was a two-move, two-person pattern (a-b) (Table 4). The instructor initiated the majority of these exchanges, usually by asking a *question*.

Table 4: Distribution of Exchanges

Exchange Patterns

# of contributors	pattern	# of occurrences	% of exchanges	instructor initiated
2	a-b	112	58.3	51
	a-b-a	21	10.9	1
	a-b-a-+	4	2.1	0
3	a-b-a+	2	1.0	0
	a-b-c	36	18.8	22
	a-b-c-+	1	.5	1
4	a-b-c-+	5	2.6	0
	a-b-c-d	9	4.7	7
	a-b-c-d-+	2	1.0	1
		192		83

The classic classroom exchange pattern of *Initiate* (instructor), *Response* (student), *Follow-up* (instructor) does not appear to be maintained in the on-line environment. It occurred only once in the 192 exchanges identified. This three-part, two-person exchange pattern (a-b-a) more often involved a pair of students. The exchange occasionally extended (a-b-a-b), and twice a third person contributed to the exchange (a-b-a-c and a-b-a-b-c). Since the *Initiate, Response, Follow-up* model was first developed in order to describe the interaction between teachers and students and not between students themselves, it is not surprising that it is not particularly descriptive of the on-line learning environment where students initiated 57% of the exchanges. At the same time, it should be noted that participants have been socialized to the face-to-face exchange patterns, and that

some students exhibit a marked preference for interacting with the instructor rather than with other students (Blanchette, 2001).

Where there were three or four contributors, the interaction frequently took the form of a chain of contributions (a-b-c-d), but less linear exchanges were also found (a-b-c-b-c-d-c-b). The instructor initiated 31 of the three and four person exchanges and contributed to an additional three in the b, c or d positions.

In her analysis, Stenström (1994) primarily explored conversations that consisted of exchanges between two speakers. On the surface, it appeared that this characteristic was typical of the on-line environment since most of the 192 exchanges had two contributors. The difference lies in the sequential nature of face-to-face interaction, which allows only one exchange to take place at any given time. This contrasts with the simultaneous nature of asynchronous communication where the same speaker may contribute to several exchanges in the same message. This is in line with Shank's (1993) contention that on-line interaction is less a dialogue than it is a multilogue. In other words, freed from the constraints of turn-taking, many contributors can "speak" at once and address as many previous comments as they choose without having their contribution lost in confusion, as would be the case should this be attempted in a face-to-face context.

Transactions

Although it is technically possible for an individual to contribute to more than one transaction (topic of conversation) within a given message, no evidence was found to suggest that this actually occurs. This may have been due to

limitations imposed by the technology rather than linguistic factors. Although students participated in up to three simultaneous discussions, the course was structured so that a separate conference was created for each different discussion topic.

Interactional Structure

When determining whether Stenström's (1994) conversational hierarchy was representative of on-line interaction, two areas of divergence were identified. The first relates to the role of turns in an asynchronous context. Essentially, the placement of turns within the hierarchy is not functional outside of verbal interaction since in asynchronous communication, a single turn may be part of more than one exchange. In addition, no allowance was made in Stenström's hierarchy for moves that did not form part of an exchange. This is a characteristic of the linear production of real-time two-person interaction where a limited number of acts combine to form relatively short moves and turns are taken in rapid sequence. In such interactions, a move that receives no response may be perceived as being inadequate in some way and may be repeated or modified until it is acknowledged. This is the case for both conversations (Levinson, 1983) and classroom interactions (Sinclair & Brazil, 1982). However, moves that receive no direct response are not uncommon on-line. A move that is not part of an exchange can still become part of the fabric of a discussion (Blanchette, in press). Figure 5 more closely represents the interactive structure found in the asynchronous text-based educational context.

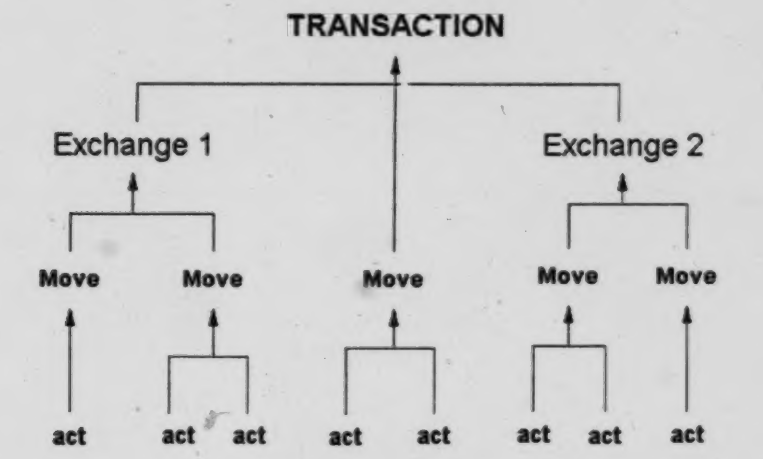

Figure 5: Interactional Structure of the On-line Learning Environment

Conclusion

Participants in this on-line learning environment made use of a variety of linguistic strategies in their communicative interactions. Most of the acts and moves identified on-line are those found in face-to-face interaction, although several of the interactive and organisational types were used to a much greater extent in the asynchronous environment. This is very likely an attempt on the part of participants to compensate for the lack of visual, paralinguistic and temporal cues that they would experience in a face-to-face context. In effect, they are attempting to create a shared context. Some types of acts and moves common to face-to-face interaction were not found in the data. These include *reject*,

Backchannel, and *Re-open*. Others, such as *quote, Phatic*, *Exposit*, and *Sign-off*, were identified as context-specific strategies.

Teacher talk in the on-line learning environment is very similar to teacher talk in the traditional classroom. At the level of acts, the instructor *directs*, *questions* and *evaluates*, while the moves remain *Repair*, *Initiate* and *Follow-up*. While ownership of these moves is less rigidly delineated, *Repairs*, primary *Initiates* and *evaluate* forms of *Follow-ups* were contributed almost exclusively by the instructor. For many of the acts and moves, the difference is largely one of quantity—the instructor simply speaks less than would be the case in a face-to-face context. The instructor's utterances accounted for just over 11% of the acts and 16% of the moves, which stands in contrast to the 66% of classroom talk that Dillon (1994) and Graddol (1989) attributed to instructors in the face-to-face context, or the 73% that Hillman (1999) found in post-secondary classes.

The variety of speech acts available to learners has been greatly enhanced. Through their use of the content-related acts of *opine*, *state*, *inform* and *comment* with the *Exposit* and *Narrative* moves, students have largely assumed the role of information provider. Even their use of *rhetoric?* contributes to this. Students continue to *Respond*, but rather than responding to the instructor, as would be the case in a traditional class, they direct their replies to fellow students. The same is true of student use of *Follow-up*, a move that some would consider out of line in the classroom. It is possible that students *Follow-up* in order to fill a perceived

void left by the reduced use of *Follow-up* by the instructor. It may be the case that participants are using this move as a substitute for *Back-channel*.

Participants, especially students, make extensive use of a variety of acts included in the categories *frame*, and *quote* to organise their contributions. Learner talk is also typified by the use of interactive acts and moves that serve to facilitate discussion. They use *meta* communicative acts to reflect on the communicative process itself. Their frequent use of *nominate* serves to compensate for the reduced paralinguistic cues afforded by the medium, and they attempt to share and set a communicative context through their use of *Phatic* strategies.

Just as the variety and distribution of acts and moves differed from that found in face-to-face interaction, so too did the exchange patterns identified. The prevalence of the two-move exchange pattern over the three-move pattern found in the traditional class can, in part, be attributed to a change in instructor behaviour. That is, the instructor did not provide the *Follow-up* move so common to instructor-student exchanges in the face-to-face setting. Instructors should also be aware that some participants would prefer to interact directly with the instructor rather than with other students. When participants interacted with each other, however, exchanges were of both of longer duration and greater complexity.

Although asynchronous text-based interaction closely resembles spoken discourse, in that a variety of acts and moves contribute to a complex and

dynamic interaction, the underlying structure of these interactions differ. The hierarchical system of acts, moves, turns, exchanges and transactions that Stenström (1994) used to describe conversation is not representative of the interaction that takes place between the teacher and students in the on-line context. Turns and turn-taking play a significant role in the management of spoken discourse, but they do not serve a linguistic function in an environment where there are no restrictions on who may speak, on the length of an utterance, or on the number of acts or moves that may be contributed at any one time. Nor does this structure account for the prevalence of moves that are not part of an exchange, but that nonetheless form part of a transaction. It was necessary to develop a new model of asynchronous interaction in order to represent the communication observed in this on-line educational context.

This study has begun the process of exploring teacher talk and learner talk in the asynchronous text-based environment, but there are a number of possible next steps. It would be valuable to determine if and how the variety of speech acts and moves develop over time. That is, does the teacher and learner talk used by novices differ from that of more experienced participants? A comparison of the talk used by teachers and students in different disciplines would also help to provide a more complete picture of communicative strategies and determine if there are different varieties of on-line teacher talk and learner talk? Finally, it appears that while many acts and moves serve the same purposes in both on-line and face-to-face environments, some, such as *question* and *rhetoric?* appear to

play a more pivotal role in participant interaction. These should be examined with a view towards determining their impact on that interaction as well as their impact on the learning process.

Notes

1. The convention for indicating acts and moves is <act and [Move. This can be intrusive when used in the body of the text. Throughout this paper, an italicized font has been used to indicate both acts and moves, and the names of moves have been capitalized to help distinguish between the two. A sentence that would have appeared as "At the level of acts, the instructor <directs, <questions and <evaluates, while the moves remain [Repair, [Initiate and [Follow-up." becomes "At the level of acts, the instructor *directs*, *questions* and *evaluates*, while the moves remain *Repair*, *Initiate* and *Follow-up*.

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Preface to Paper 3
Questions in the On-line Learning Environment

In this final study, I have again examined the transcripts used in the previous two papers, this time in order to explicate the role of questions and questioning behaviours in this environment. In the process of analysing these questions, I compared their syntactic structure, cognitive functions, pedagogical features and communicative characteristics with those identified in the literature relating to face-to-face post-secondary classrooms.

In part, this study has developed from the speech act analysis described in the previous paper, because the focus of the following paper is a specific type of speech act—questions. This was the aspect of the previous study that I felt was most in need of further exploration. In this section of the research, however, I am moving beyond the realm of syntactic form and incorporating the concept of cognitive function.

Again, I have chosen to build upon a progression of previous research. This progression begins with the work of J.P. Guilford (1956), who was concerned with the operation of thinking and developed the Structure of Intellect model. This model, unlike that of Bloom, Guilford's contemporary, focussed on the process of cognition. From this model, Gallagher and Aschner (1963) developed a categorical system incorporating the concept of "productive thinking" (routine thinking, cognitive memory, convergent, divergent and

evaluative). Then Barnes (1983) applied this system to the college setting. Her landmark study revealed, among other things, that in the postsecondary environment, very little classroom time was spent on questions and that most instructors' questions were representative of the lowest cognitive levels. This was in keeping with the other studies that explored questions in post-secondary education and which are discussed in greater detail in the following paper. Table 1 summarises the Gallagher and Aschner classification system in greater detail than is found in Chapter 4.

Table 1: Gallagher and Aschner System for Classifying Thought Processes.

Routine Thinking This category includes routine classroom procedural matters such as management of the classroom, the structuring of class discussion and approval or disapproval of the idea or the person. ▪ Management ▪ Structuring ▪ Verdict
Cognitive-Memory Cognitive-Memory operations represent the simple reproduction of facts, formulas and other items of remembered content through use of such process as recognition, rote memory and selective recall. ▪ Recapitulation ▪ Clarification ▪ Factual
Convergent Thinking Convergent thinking is a thought operation involving the analysis and integration of given or remembered information within a data-rich context. It leads to an expected result because of the tightly structured framework that limits it. ▪ Translation ▪ Association ▪ Explanation ▪ Summary/Conclusion

Evaluative Thinking

Evaluative thinking deals with matters of value rather than matters of fact and is characterized in verbal performance by its judgmental quality (i.e., desirability, worth, acceptability, or probability of occurrence.

- Rating
- Choice
- Qualified Judgement

Divergent Thinking

In a Divergent Thinking sequence, individuals are free to independently generate their own data (ideas, associations, implications, etc., of which no single one could be predetermined as the uniquely correct answer) within a data-poor situation, often taking a new direction or perspective.

- Elaboration
- Divergent Association
- Implication
- Synthesis

Aschner, et al. (1961)

As noted in the Introduction, this was the most methodologically challenging portion of the research. Unlike the study of speech acts, where there is no tradition of providing indicators of reliability, this final study is not entirely a linguistic one. A large portion of the study pertains to cognitive functions, and that is a realm where reliability figures are routinely provided and often demanded. I must admit that I tried, quite unsuccessfully, to comply with these expectations.

I asked two other people to replicate part of the coding—in this case the codes that related to syntactic structures. I provided them with a definition of the syntactic forms (those that appear in the body of the paper—e.g., Yes/No, Wh-Narrow, Wh-Broad questions) and a list of the questions to be placed in each category. Not surprisingly, there was perfect agreement. It is easy enough to

explain why this would happen. The determination of linguistic forms and functions are learned communication skills, so identifying which question fit into each category was obvious to any native speaker of the language (Pinker, 1994). So, for the linguistic portion of the study, the percentage agreement between the coders was rendered meaningless because what it measured was inherently trivial.

In the part of this study that related to cognitive function, the opposite was true, in that, with the exception of the 'Routine' category, there was virtually *no* agreement between the way in which I coded the questions and the way my auditors coded them. This underscores the importance of shared context. My auditors had no familiarity with this particular group of students and, as a result, were unable to accurately determine the cognitive level of the questions. Here, providing a rating of inter-coder reliability would have been worse than meaningless.

Still, it was important that I receive some independent validation for my coding decisions. To this end, I reviewed each of the questions that had been included in the audit sample with one or another of my auditors and provided a rationale for my decisions. So, for example, where an auditor had coded a question as requiring divergent thinking (e.g., *What is the difference between self-directed learning and independent learning?*), I would explain that this material had already been addressed in the course readings and had also been discussed in great depth, so that it had been asked in a data-rich context. After providing evidence that my explanation was factual, we agreed that the question would

more appropriately be coded as one that called for convergent thinking. This process continued until my auditor was convinced that my coding decisions were representative of the interaction as it occurred in context. As I proceeded to code the rest of the transcripts, I set aside those questions where I was not immediately certain of the cognitive level, and discussed them with one of the auditors. The entire process took a great deal of time and no little effort to complete. I think that it was worth that effort, however, because it enabled me to establish a degree of credibility that would not have been possible had I adhered to reliability formulae.

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Questions in the On-line Learning Environment

Teachers and students have well-developed schemata for asking and answering questions in a formal learning context. Since the rules governing classroom interaction have remained relatively unchanged since elementary school, they have essentially become part of the tacit knowledge shared by participants. But, when the learning context changes from the familiar face-to-face environment to the asynchronous, textual context of the computer-mediated environment, long-established communicative norms and strategies also change. Just as rules such as those regarding turn-taking are no longer valid, the guidelines governing the process of asking and answering questions no longer necessarily resemble those we have internalized over the years.

What is a question? Hunkins (1995) defined questions as "complex linguistic structures designed to engage individuals cognitively and affectively in processing particular contents" (p. 114). At its simplest, a question is an expressed request for information. These requests can take a variety of forms and can fall into a number of different categories depending upon the context within which they are being studied. This context also influences the terms chosen to describe questions as well as their definitions. Linguists have long concerned themselves with the grammar of questions (formal linguistics), the relationship

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between questions and answers (conversational analysis), and the function of questions (sociolinguistics). Within the realm of teaching and learning, questions have been cited as not only the most often used, but also the single most important strategy employed by instructors (Ellis, 1993; Foster, 1983; Schiever, 1991).

Teachers' questions and students' responses are the main interaction in the traditional classroom and, as such, they are essential to teaching and learning (Dillon, 1988). This interaction has been the subject of extensive research, but the preponderance of these studies has been conducted within the school system rather than in post-secondary institutions (Edwards & Bowman, 1996; Ellner & Barnes, 1983; Graesser & Person, 1994; West & Pearson, 1994). Even fewer have focussed on the questions asked in the text-based technology-mediated context of on-line teaching and learning (Muilenburg & Berge, 2000; Waugh, 1996).

The purpose of this study was first to identify both:

- the linguistic structure of instructor/student questions (syntactic form); and
- the cognitive operations inherent in instructor/student questions (function).

This information was then analysed so as to determine if there exists a relationship between:

- question form and function; and
- instructor and learner questions (along the dimensions of both form and function).

In addition to identifying linguistic structure and cognitive functions, this study also attempted to:

- identify the pedagogical and communicative characteristics of questions asked in this on-line environment.

Issues in Questioning

Research on questions and questioning within the context of education, whether K-12, post-secondary, or on-line, has addressed the frequency, associated wait time, and cognitive level of questions. Most of this research has addressed the issue of frequency—how often or how many questions the instructor asked either during a specific period of time or during a specific type of activity. Levin and Long's (1981) report that teachers ask between 300 and 400 questions per day is in keeping with other research conducted in the school system. It is not, however, representative of the use of questioning within the context of post-secondary education. Here, few questions are asked. Less than 4% of instructors' time was spent asking questions (Barnes, 1983; Graesser & Person, 1994; Smith, 1983; West & Pearson, 1994). Another distinction between the two contexts was Barnes' finding that one third of the questions asked by college instructors remained unanswered. Although instructors ask the majority of questions in face-to-face classrooms, this is not so for on-line learning environments. Blanchette (2000) found that 11% of instructor utterances were questions, and that students

contributed 69% of the questions. Within the on-line context, the focus has tended to be on the frequency of student questions (Waugh, 1996).

Wait time (Rowe, 1972) is the period of silence that follows teacher questions (wait time I) and students' responses (wait time II). This period typically lasts 1.5 seconds, but when extended to at least 3 seconds, increases in the length and correctness of student responses, number of students volunteering responses, number of student-initiated questions, and achievement-test scores have also been observed (Rowe, 1987). Rowe's conclusions are supported by Tobin (1987) who conducted a review of 50 published studies of wait-time. Wait time, or think time, is inherent in asynchronous interaction; one of the benefits of on-line learning is the way in which it allows participants the opportunity to provide a thoughtful response to questions (Blanchette, 1999; Eastmond, 1995).

The cognitive level of instructor questions within the school system has been studied extensively (Dillon, 1988, 1994; Gallagher & Aschner, 1963; Guilford, 1956; Hunkins, 1995; Morgan, 1991; Wilen, 1991). Although questioning plays an important role in classroom interaction, there are those that maintain that teachers' questions, especially those at the lower cognitive levels, have a negative outcome. Dillon (1994) takes the position that such questions neither stimulate student thinking nor encourage participation. At the post-secondary level, studies have found that questions asked by instructors tend to be at the lower cognitive levels (Barnes, 1983; Fischer & Grant, 1983). Barnes

found that 80% of questions asked in college classrooms asked students to recall facts.

Conceptual Framework

The Structure of Intellect model was first proposed by Guilford in 1956. This model has three separate but interconnected dimensions: 1) the content of the information, 2) the operation performed on the information, and 3) the products resulting from that processing. The second dimension—operations—is further subdivided into 5 categories: cognition, memory, divergent production, convergent production and evaluation. It was also the part of the model of most relevance to education, and based on this element, Gallagher and Aschner (1963) developed a classification system that incorporated the concept of "productive thinking" to describe the cognitive levels observed in classroom interaction. The cognitive categories in their model are: 1) routine thinking, 2) cognitive-memory, 3) convergent thinking, 4) divergent thinking, and 5) evaluative thinking. In 1983, Barnes applied the Gallagher and Aschner system to the college setting in her landmark study of instructor questioning behaviours in 40 classes at a variety of post-secondary institutions. She found that the majority of instructors asked questions that required little or no thought on the part of students. Edwards and Bowman (1996) also used Gallagher and Aschner's model in their study of instructor questioning in a non-traditional post-secondary classroom, which revealed that the type of questions asked were influenced by instructional format

(lecture, media presentation or student presentation). To date, this model has not been applied to an on-line learning environment.

The Study

The 17 subjects in this study are participants of a graduate degree program that uses computer conferencing to facilitate interaction. The transcripts of their on-line interactions, conducted over a period of eight weeks, consist of 556 messages distributed among 27 subconferences. From these messages, 352 were selected for analysis. These messages were posted in seven topic conferences, which were further divided into 22 small-group discussion conferences. These discussions were conducted entirely on-line. Discussions that comprised a combination of on-line and video, audio, or face-to-face interaction were excluded from the analysis.

Method

This study takes what is essentially a discourse analysis approach to the study of on-line interactions, by viewing them as conversations—linguistic units larger than a sentence or utterance and involving more than one person—that take place within a specific context (Schiffrin, 1994). At the same time, following Green and Harker (1988), the transcripts were analyzed from a variety of perspectives—linguistic, cognitive, and pedagogical—in order to enhance the depth of the overall study. Using the HyperResearch qualitative software package

questions were categorized according to the linguistic, pedagogical and cognitive classifications listed below.

A Linguistic Approach To Classification

Four major syntactic categories—statements, questions, commands and exclamations—are sufficient to describe simple sentences. These are commonly referred to as declarative, interrogative, imperative and exclamatory sentences. Interrogative sentences, or questions, can further be divided into two sub-categories—*yes-no* questions and *wh*-questions—depending on the type of answer they would be expected to receive (Quirk & Greenbaum, 1973). While some linguists maintain that these two sub-categories are sufficient to classify all questions, others subdivide the list to include a number of minor question types. This study will focus on the major categories of Yes/No questions and both the narrow and broad forms of Wh-questions. With the exception of Alternative questions, which can belong to either the Yes/no or Wh- groups, the other minor categories are variants of Yes/no questions and will be discussed in less depth. Following is a simple taxonomy of question types, arranged according to syntactic form.

Major Categories:

1. Yes/No questions. These polar interrogatives begin with a verb (be, have or do) or a modal verb, followed by the subject. *Are we meeting after class?*

2. Wh-questions. These generally begin with an interrogative word (who, what, when, where, why, how). They are commonly known as information questions because they ask the responder to provide particulars (Woodbury, 1984).

   - Who (whom, whose), where, when, which are classified as narrow wh-questions. *When is the meeting?*
   - What, why, how are classified as broad wh-questions, since they allow a wider range of responses. *What is the meeting about?*

Minor categories:

1. Alternative or Disjunctive questions. These can take either the verb-subject form or the wh-form. Disjunctive questions offer a choice of answer. *Do you want to meet before class or after?*
2. Tag questions. When a particle is added to the end of a declarative sentence, the entire statement becomes a question. This type of question generally seeks confirmation. *We're meeting after class, right?*
3. Declarative or Indirect questions. These are questions that appear on the surface to be statements, but the underlying form is that of a question. *I assume we're meeting after class.* is interpreted as *Are we meeting after class?*
4. Moodless questions. These non-clausal forms have neither a subject nor a finite verb. *Questions?*

5. Echoic questions. These consist of a repetition of a portion of a preceding utterance and usually are a request for clarification. A: *We're meeting after class.* B: *After class?*

A Cognitive Approach To Classification

Aschner, Gallagher, Perry and Afsar (1961, p. iv-viii) identified the following five categories of thought processes (examples are from the course transcripts).

1. Routine (R) questions. These refer to procedural matters, structure of class discussion, and approval or disapproval of ideas. *Are there any questions?*
2. Cognitive-Memory (C-M) questions. These require the use of recall or recognition in order to reproduce facts and other items of remembered content. *What are the five steps in Knowles' self-directed learning model?*
3. Convergent Thinking (CT) questions. The tightly structured framework of these questions requires the analysis or integration of given or remembered data, leading to one expected result. *Based on this model, what are the goals of education?*
4. Divergent Thinking (DT) questions. These questions permit an independent generation of ideas, directions, or perspectives within a data-poor situation. *Why is learning necessary?*

5. Evaluative Thinking (ET) questions. These questions are concerned with values rather than facts and convey a judgmental quality. *Is this approach worth the effort?*

Verbal interaction is inherently complex, however, and this is no less true within the classroom. When deciding which of these categories best describes a particular question, such materials as readings or other resource materials can be determining factors, as can the content of lectures and earlier discussions. For example, the question *"What are the implications for adult education?"* could be a Cognitive-Memory question if a list of implications had been provided in the course reading package. It could be a Convergent Thinking question if it asked students to draw conclusions from a reading or earlier discussion (data rich context), or it could be a Divergent Thinking question if this was an entirely new topic and the goal was to encourage participants to generate new ideas (data poor context). The appropriate category can only be determined in context.

A Pedagogical Approach To Classification

Unlike linguists, educators use a wide variety of terms to describe and categorise questions. Morgan (1991) selected 50 different terms, 3 major categories and 16 sub-categories to describe questions used within the classroom. Hunkins (1995) identified an equally broad range of terminology as well as 8 classification systems. The following taxonomy of question types contains the terminology pertaining to the current study:

1. Educative questions. The most basic distinction is the one between everyday questions and educative questions (Dillon, 1982; Hunkins, 1995; Morgan, 1991).

   - Everyday questions arise spontaneously from the conversational circumstances.
   - Educative, or productive, questions encourage students to view situations from alternative perspectives, to think and to learn.

2. Epistemic questions. These are either display questions or referential questions.

   - Display questions are those where the teacher already knows the answers.
   - Referential questions are those to which the answer is unknown.

   In general conversation, most questions are of the referential variety (Weber, 1993). This contrasts with classroom interaction where display questions are common (Gaies, 1983). Within the classroom, most student-initiated questions are referential, although instructors frequently respond by asking a display question (Markee, 1995).

3. Transpersonal questions. These "ask students to reflect on their inner voices, their inner life and also on the infinite, the big picture... who they are and how they feel about themselves and their world" (Hunkins, 1995, 108).

4. Initiating questions. These questions are used to introduce a new discussion topic.

5. Probing questions. Probing questions can be used to remove ambiguity, to request elaboration, or to broaden participation.

Results

An analysis of the course transcripts identified 297 questions. Of these, the instructor asked 68 (22.9%) and the students asked 229 (77.1%). These results are consistent with earlier studies indicating that students in on-line courses ask the majority of questions. Mapping the responses to the questions showed that six (8.8%) of the instructor's questions went unanswered. This is considerably lower than the 33% identified by Barnes (1983).

Syntactic Form of Questions

Syntactic form was examined according to the major categories of Yes/No, Wh-broad and Wh-narrow questions. Both the instructor and the students used Yes/No questions most often and Wh-Narrow questions least often (Table1). Although the alternative, or disjunctive form can be a variant of either Yes/No or Wh-questions, all instances of this minor form were found to be belong to the Yes/No classification. Participants' usage of these variant forms was limited with the Moodless form being used most frequently.

Table 1: Syntactic forms used by the instructor and students

Syntactic Form	Instructor *(n=68)*	Students *(n=229)*
Yes/No	42.6%	48.5%
Disjunctive	1.5%	5.2%
Tag	.0%	0.9%
Indirect	.0%	0.9%
Moodless	4.4%	9.6%
Echo	.0%	.0%
	48.5%	65.1%
Wh-Broad	47.1%	27.5%
Wh-Narrow	4.4%	7.4%

Cognitive Function of Questions

While all five categories of cognitive function were evident in both the instructor's and the students' questions, the Evaluative Thinking function was the most frequently used by all participants (Table 2).

Table 2: Congitive functions inherent in instructor's and students' questions.

Cognitive Function	Instructor *(n=68)*	Students *(n=229)*
Routine Thinking	11.8%	30.1%
Cognitive-Memory	13.2%	5.2%
Convergent Thinking	30.9%	18.3%
Divergent Thinking	10.3%	14.0%
Evaluative Thinking	33.8%	32.3%

As can be seen in Table 2, 75% of the instructor's questions were at the higher cognitive levels. The majority of student's questions (64.6%) were also at the higher cognitive levels.

Relationship Between Form and Function of Questions

Incidences of syntactic form and cognitive function were cross-tabulated, and these values were compared to the expected or theoretical frequencies (Table 3). The value of χ^2 was found to be 77.57. For *df*=28, this is highly significant since the value of 48.28 is significant at the 1% level. This would indicate that there is a stronger relationship between the syntactic form and cognitive function of questions than would appear by chance.

Table 3: Contingency table showing the relationship between syntactic form and cognitive function of questions and the calculation of expected values.

Cognitive Function	Yes/no	Wh-Broad	Wh-Narrow	any form
Routine thinking	53 (47.2)	17 (24.6)	7 (5.2)	77
Cognitive memory	14 12.9)	5 (6.7)	2 (1.4)	21
Convergent thinking	33 (38.6)	28 (20.2)	2 (4.2)	63
Divergent thinking	4 (23.9)	33 (12.5)	2 (2.6)	39
Evaluative thinking	78 (59.4)	12 (31.0)	7 (6.5)	97
any thinking	182	95	20	297

In order to determine if there was a relationship between either the form or function of questions asked by the instructor and students, participants' use was plotted across each of the seven discussions. There does not appear to be any relationship between the syntactic forms used by the instructor and the students. That is, an increase or decrease in the use of any particular form by the instructor

does not correspond to any increase or decrease in the use of that form by students.

Pedagogical Features of Questions

Questions exhibiting each of the four classes of pedagogical features—educative/everyday, epistemic (referential/display), transpersonal, and probing)—were found in the transcripts. The occurrence of each class is itemized in Table 4.

Table 4: Syntactic forms used by the instructor and students

Pedagogical Feature	**Instructor** *(n=68)*		**Students** *(n=229)*	
Educative questions		92.64%		77.73%
Everyday questions				
Organisational	4.41%		6.11%	
Appeal	2.94%		10.48%	
Personal	.0%		5.68%	
		7.35%		22.27%
Epistemic questions				
Referential	89.71%		100%	
Display	10.29%		0%	
Transpersonal	1.47%		3.06%	
Initiating	41.18%		0%	
Probing	33.83%		1.31%	

The vast majority of both the instructor's and students' questions were of an educative nature. Everyday questions were posed at the level of Routine Thinking and were concerned with organisational issues such as requests for clarification (e.g., *"Do you mean four each or four as a group?"*), personal questions (e.g., "*Have you moved?*"), or appeals for feedback (e.g., "*What do you*

think of that?"). The instructor asked only five everyday questions (three organisational and two appeals) while students asked this type of question 51 times (14 organisational, 24 appeals, and 13 personal questions). The instructor's questions were primarily referential, with only seven display questions being asked. Students asked referential questions exclusively. Students also asked seven transpersonal questions while the instructor asked only one. The instructor asked probing questions on 23 occasions while students asked this type of question three times.

Other Communicative Characteristics of Questions

While examining the transcripts in order to identify the forgoing characteristics of questions asked by participants, a number of other traits became evident. First, questions were frequently asked one after the other, or "chained" together. Second, numerous uses of the phrases "I wonder" and "What if" were observed. Third, it was not an uncommon practice for participants to answer their own questions. Finally, it was noted that these three characteristics often appeared in conjunction. In face-to-face interaction, these traits are frequently descriptive of rhetorical questions. The syntactic form of questions exhibiting these characteristics is shown is Table 5, while the cognitive function of these questions can be found in Table 6.

Table 5: Syntactic forms of those questions exhibiting characteristics associated with rhetorical questions.

Syntactic Form	Instructor *(n=5)*	Students *(n=127)*
Yes/No	80.0%	47.24%
Disjunctive	.0%	4.72%
Tag	.0%	1.57%
Indirect	.0%	0%
Moodless	.0%	7.09
Echo	.0%	0%
	80.0%	60.63%
Wh-Broad	20.0%	29.13%
Wh-Narrow	0%	10.24%

Table 6: Cognitive functions inherent in those questions exhibiting characteristics associated with rhetorical questions

Cognitive Function	Instructor *(n=5)*	Students *(n=127)*
Routine Thinking	20.0%	18.90%
Cognitive-Memory	.0%	3.94%
Convergent Thinking	.0%	28.35%
Divergent Thinking	.0%	17.32%
Evaluative Thinking	80.0%	31.50%

Another feature that was characteristic of student questions took the form of an "Appeal" (n=24). These questions invited a response and were usually found at the end of a message. The majority of the Appeals were at the level of Routine Thinking (92.9%) and in the Yes/No form (71.4%). Of these, the Moodless syntactic form was used more than half of the time (57.9%). The instructor used the "Appeal" question format twice.

Discussion

While it is possible to use basic statistical methods to describe some features of questions and questioning, other elements are more difficult to quantify. Nonetheless, an exploration of these elements is necessary to the study of the questions asked by participants in this asynchronous context if the role of questions is to be fully understood. In keeping with a multiple perspective analysis approach (Green & Harker, 1988), the following discussion also addresses those aspects that are not amenable to quantification.

Syntactic Form of Questions

For the most part, participants in this on-line environment used the same syntactic forms as would be found in a face-to-face classroom, albeit in a somewhat more limited range. For example, no Echo questions were identified on-line. It is possible that Echo questions are considered to be too ambiguous for on-line interaction. Simply repeating what was said, without any paralinguistic cues does not provide any insight as to what additional information is required.

The potential for ambiguity may also explain why indirect questions were rarely used. This syntactic form is relatively dependent on changes in intonation to distinguish it from a statement. In the transcripts, participants used "I wonder" and "perhaps" to help identify their indirect questions (e.g., *"I wonder if such a profile already exists."*).

Another common syntactic form that was almost non-existent in this on-line classroom interaction is the Tag question. This is notable because Tag questions have long been considered to be a characteristic of female speech (Eakins & Eakins, 1978; Lakoff, 1975; Tannen, 1990). It is such a consistent marker that even when participants in an on-line discussion used aliases to conceal their identities, female gender was assigned to participants in large part according to their use of this syntactic form (Gal, 1995; Herring, 1996; Wallace, 1999). Since three quarters of the participants in the current study were female, if Tag questions were a consistent gender marker, a much larger number of such question should have been found. This could support the research that identifies power rather than gender as being a more important determining factor in the use of "feminine" speech characteristics (O'Barr and Atkins, 1980; Wallace, 1999). Participants in this course were relatively homogeneous with relation to social and professional status.

Cognitive Function of Questions

With regard to the cognitive function of questions, 75% of the instructor's questions were at the higher cognitive levels. This proportion of questions at the higher and lower cognitive levels are almost the opposite of the proportions in Barnes' (1983) study of face-to-face interaction where she found that 80% of instructors' questions required little or no thought on the part of students. This would appear to indicate that interaction in this on-line context was more intellectually demanding than that found in the face-to-face classroom. One

possible explanation for this disparity relates to the organisational features of on-line interaction. The asynchronous environment can be structured so that routine questions of an organisational or administrative nature are posted in an entirely different area from that where discussions of course content would take place. Secondly, the immediacy of face-to-face interaction may influence instructors to use routine questions as a form of comprehension check. It is also possible that face-to-face instructors may use these lower level questions as a type of filler or placeholder, as a segue from one part of a lecture to another, or as a frame or scaffold to focus student's attention on what is to come. The on-line instructor, being unable to observe paralinguistic cues, would gain little from adopting these strategies. In text-based interactions, bullets, numbering and white space are among the more effective organisational tactics used to focus attention or make the transition from one point to the next.

Unlike face-to-face interaction where students ask few questions (West & Pearson, 1994), students in this on-line context asked many questions. Routine Thinking questions were common (30%). This reflects the phatic nature of student-student interaction. Students also asked for clarification and made appeals for feedback from other participants. These all took the form of Routine Thinking questions, and this closely parallels the type of question-asking that occurs in face-to-face conversations. On those occasions when students asked Cognitive-Memory questions (5%), they were requests for specific factual information that they knew was available to another student. For example, one

student asked, "*Can you tell me how long that's supposed to take? I know* [name of previous instructor] *discussed it, but it's slipped my mind."* Convergent Thinking questions accounted for only 18% of these. Nearly 65% of student questions were at the higher cognitive levels.

When asked by a student, Convergent Thinking questions appeared to be seeking more details or some form of explanation (e.g., *"what would be the benefits of grouping developmental levels together?"*). Most of the Convergent Thinking questions were asked by the instructor, and in addition to requesting explanations, they sought justification for a position or asked students to draw conclusions (e.g., *"What are the four major principles that you would suggest, on the basis of these assumptions?"* or *"Do these principles apply to all learners?"*). It was not unusual for the instructor to ask probing question at this cognitive level.

Divergent Thinking questions were asked less frequently by the instructor than any other type of question (10%), and relatively infrequently by students (14%). As might be expected, there is a very strong positive relationship between the Wh-Broad syntactic form, that is, those asking "what, why, or how," and the Divergent Thinking function (e.g., *"What can educators do to foster self direction?"*). This form is the most open and would be the most effective way to elicit a more wide-ranging response. The instructor tended to ask Divergent Thinking questions to initiate a discussion, but those asked by students did not appear in any specific position in the discussion.

Evaluative Thinking questions were the type most often asked by both the instructor and students. This cognitive function accounted for 34% of the instructor's and 32% of the students' questions. One notable finding was the relationship between the Yes/No form and the Evaluative Thinking function. Evaluative questions were more likely to be posed in the Yes/No form than in any other (e.g., *"Is self-evaluation more accurate than instructor evaluation?"*). Although a particular form of question when asked in an ordinary conversation will elicit a like response (Quirk & Greenbaum, 1973; Stenström, 1984), this generalisation did not hold true in this environment. None of the Yes/No questions received a simple yes or no answer. In every case, such a response was accompanied by a full explanation for the response. These findings contradict the views of those who argue that Yes/No questions should be avoided in an educational setting (Dillon, 1994; Hunkins, 1995). While that position may have some merit within the K-12 context, within this on-line post-secondary environment, Yes/No questions neither led to a minimal Yes/No response (Hunkins, 1995) nor did they stifle discussion (Dillon, 1994). In fact, some of the most extensive interaction arose from just such questions.

Generally speaking, the cognitive level of responses to the instructor's questions matched the cognitive level of those questions. That is, questions posed at a Cognitive-Memory level received a response that exhibited Cognitive-Memory thinking, Evaluative Thinking questions received Evaluative Thinking answers and so on. Although this initially appeared to be the case with student

questions, a closer examination showed a more complex response pattern. Appeals posed at the Routine Thinking level formed the vast majority of student questions that received one or more responses. These responses were, themselves, at the Routine Thinking level, but that Routine response was invariably followed with additional discussion at the cognitive level of the message preceding the appeal. So, if student A wrote a message at the Divergent Thinking level and concluded with a Routine Appeal (*"What do you think?"*), student B might write a Routine response (*"I agree."*) but then follow on with an explanation or justification that also exhibited Divergent Thinking. Moreover, the level of both student A's and B's messages tended to reflect the level of the instructor's initial question.

It would appear that cognitive level of the question is a greater determinant of interaction than is the syntactic form. Routine Thinking questions, particularly those concerning organisational matters garnered responses but did not lead to interaction on the part of participants. Cognitive-Memory level questions always received a response, but never generated any interaction. It is difficult to imagine a situation where such a question would spark interaction. Since asynchronous discussion permits participants to consult their texts and other resources, the answers obtained through this type of question tend to be extremely accurate (often including source citations) and the correctness of the response is rarely open to dispute. Cognitive-Memory questions appear to serve a specific purpose—to highlight a particular aspect of the assigned readings by having a

student post that material to the discussion. Convergent Thinking questions did not tend to generate a great deal of interaction either. In fact, such questions, usually appeared later in the discussion after participants had responded to either Divergent Thinking or Evaluative Thinking questions. Questions at these latter two cognitive levels generated the most interaction, with Evaluative Thinking questions providing the greatest stimulus for discussion.

Pedagogical Features of Questions

Of the two forms of epistemic questions, referential questions were asked more frequently than were display questions. The instructor asked only seven display questions, all of which were at the Cognitive-Memory level. This stands in contrast to Gaies' (1983) observation that display questions asked by the instructor are the dominant epistemic form. Students asked no display questions, however, and this concurs with Markee's (1995) observation that most student-initiated questions are referential. This is not to say that participants only asked questions for which they did not have an answer. Instead, it reflects the higher cognitive levels inherent in the questions, in that these questions often had many possible answers.

Transpersonal questions were not common in the interaction. Students asked seven such questions, while the instructor asked only one. These were always at the level of Evaluative Thinking (e.g., *"Is it possible, or even desirable to separate your emotions from your actions?"*). When students posed

transpersonal questions, they appeared to be asking the question of themselves rather than of other participants.

More Initiating than Probing questions were found in the transcripts. The instructor was responsible for the majority of both types, asking 28 Initiating questions and 23 Probing questions. The number of Initiating questions asked by the instructor had an effect on the amount of interaction. When the instructor initiated a discussion topic by asking one question, or up to three related questions, student interaction was greater than when a larger number of questions was asked. The reduced interaction was most noticeable in one conference when the instructor posted a list of 16 unrelated or only loosely related questions and instructed students working in small groups to *"...select 4 questions for discussion..."* These instructions led to a variety of responses. In the first group, five students replied to one question each. Four of these questions formed the foundation for the remaining discussion. In another group, six questions were answered, but only three led to discussion. In each group, at least one participant appeared to interpret the instructions as they might have on a written examination. That is, they each answered—discussed—four questions, either in a single message or in four separate messages. In one group, 12 of the 16 questions received a direct response. No further discussion followed from their responses to these questions. The variety of responses indicates that students may not have known how to respond appropriately to the ambiguously worded instructions.

While the instructor asked nearly as many Probing as Initiating questions, students asked only 3 Probing questions. Probing questions could serve to stimulate interaction, but that was not always the case. It appeared to depend on whether the question was addressed to a group or an individual. In the former case, interaction was generally forthcoming. When a probing question was directed to an individual, however, it tended to develop into a two-way conversation. Probing questions asked by students fell into the latter category.

Other Communicative Characteristics of Questions

Not all questions received a direct reply. There was a considerable discrepancy between the number of instructor questions and students' questions that went unanswered. Two types of instructor questions did not receive a verbal response. The first type was the Routine Thinking question of an organisational nature, (e.g., *"Did that make sense?")*. In a face-to-face classroom, such a question would likely have received some sort of confirmation, either verbally or through body language. On-line, it only received a response if the answer was negative. The act of following the directions provided the confirmation that the instructions did make sense. The second type of unanswered question was distinguished by its position in the discussion. Occasionally, the instructor would ask a question in the concluding message. These questions could take any syntactic form or be at any cognitive level, but by following such a question with a phrase such as *"Just something for you to think about."* it was clear that they were intended for individual reflection. While 92.2% of the instructor's questions

received a direct reply, that was true for only 16.2% of the questions asked by students. The lack of a direct response does not, however, necessarily mean that a question was ignored. Studies of lexical references (Blanchette, in press; Howell-Richardson & Mellar, 1996; Jara, 1997) have shown that comments and questions that appear on the surface to have been overlooked, do in fact, form part of the fabric of the discussion. Unanswered questions were frequently characterised by one or more of those traits associated with rhetorical questions. That is, they appeared in clusters, or chains, they contained such phrases as "what if," and the person who asked the question often answered it.

Rhetorical questions are not a special category of questions. They can take any syntactic form or reflect any cognitive level. Rather, they are a special use of questions, and in the transcripts, they appear to have been used in three different ways. These can be described as lecturing, thinking aloud, and indirectly challenging. In each case, the first speaker asks a series of questions, most of which can be read as statements in interrogative form. It is not uncommon for the questioner to then reinforce this statement by providing the appropriate or desired response. For example: *"Is it feasible in our current system and with the current expectations of education to leave students who are not at this point yet, on the sidelines? In today's system, it is not feasible."* Whether this example would be perceived to be thinking aloud, lecturing, or indirectly challenging, depends upon several contextual factors.

First, there is a noticeable difference in the length of each type of message, with the lecture format tending to be considerably longer (as long as two to three pages). While this might be considered a superficial difference, the extra length was the result of the writer's use of strategies typical of formal rhetoric. The lecture form provides evidence of extensive research. It is organised into sections and structured in a logical sequence. The language used is also more formal than that used in other messages. Perhaps, most importantly, there is an obvious and definite attempt to persuade the reader. Questions, in this context, were used to either make or reinforce a particular point. These messages seldom received a reply, and on those occasions where a response was forthcoming, it did not include an answer to any of the question posed therein. Almost all participants used rhetorical questions to make and support arguments, but male students were more likely to use an extended lecture format. Two male students used this form more than half of the time while a third used it almost exclusively, writing multiple page "lectures" containing very long strings of rhetorical questions.

When thinking aloud, participants not only sent shorter messages using an informal tone, they also appeared to be seeking clarification or enlightenment. The context was often one of self-disclosure or reflection. When the questioner provided an answer to his or her own question, it generally expressed a degree of tentativeness in contrast with the tone of authority used in the lecture form. It was not uncommon for questions to be followed by such comments as *"I don't know what to make of this."* or appeals for feedback or comments. These questions

introduced new ideas for discussion and frequently served as a catalyst for higher levels of interaction among participants, even though they did not necessarily receive a direct reply.

The third use of rhetorical questions, indirectly challenging, was occasionally interactive. When indirectly challenging, a participant replied to an earlier message by asking a series of rhetorical questions but without commenting directly on any of the points in that message. This might precipitate a similar response, that is, a message containing another list of questions. Since this could go back and forth for some time, it might be more accurate to describe this form as "duelling questions." When challenging questions were made in response to a lecture, either the message containing these questions would receive no response or it would be acknowledged, but the questions themselves would remain unanswered. There was a third possible response to a list of challenging questions. When the questioner concluded with an explicit request for comments or feedback, often calling on the expertise of other participants, these questions, although not receiving a direct reply, did serve to stimulate group discussion.

The use of these indirectly challenging questions appeared to allow participants to disagree without engaging in direct confrontation. Participants could express their disagreement indirectly, thereby allowing the discussion to proceed without having to resolve the potentially confrontational issue. Only female participants used rhetorical questions as indirect challenges while male participants always expressed their disagreement with other students directly. For

example, in response to a criticism of assessing stages of development, a male student replied, *"I don't think it would hurt to have your students complete a development stage profile..."* and continued to give his reasons for disagreeing. A female student replied with a series of questions, *"Should our institutions [attempt to meet the needs of] students at different developmental levels?...Should we attempt to be flexible? Or should we...provide opportunities for individuals to work and learn at different levels?"* This is not to say that female participants did not express disagreement directly, but rather that male students never used the indirectly challenging form when addressing messages posted by other students.

Conclusions

As is true in the face-to-face context, questions play an important role in on-line interaction. Nonetheless, there are many differences in the way questions are used in each environment. Questions asked on-line draw on a more limited range of syntactic forms, but they exhibit higher levels of cognitive function. It has become evident that the latter plays a more important role in stimulating ongoing interaction. Questions phrased to elicit a yes or no answer do not, in fact, lead to abbreviated responses, nor do they discourage interaction in the on-line context if their content is at a higher level of cognitive functioning. Barnes (1983) suggests that professors who want to improve their teaching may want to analyse the level and patterns of questioning they use. This is equally true in the on-line environment, where questioning strategies that may have been effective in the face-to-face classroom do not achieve the expected outcomes. They may also

want to ensure that they are taking full advantage of the strengths of asynchronous communication. For example, since asynchronous interaction does not suffer from the same time constraints as does face-to-face teaching, it is possible to ask more of the higher cognitive level questions that require a longer processing time.

Students made extensive use of rhetorical questions. These questions are used to persuade others, to express thoughts, and to avoid direct confrontation when challenging the statements of other participants. So, while questions at the lower cognitive levels may indicate that a student lacks information, most rhetorical questions exhibit higher cognitive functions. They are more often used to demonstrate knowledge or to construct knowledge. The instructor asked few rhetorical questions, instead using probing questions to encourage participants to expand upon their ideas. When these questions are directed to the group, they are very successful in stimulating further discussion, provided they do not come too close to the end of the time allocated for discussion of a particular topic. Just as with face-to-face education, when asking powerful questions, it is essential to schedule sufficient time to process them (Hunkins, 1995).

This study describes the questioning behaviour used within a specific environment, but the topic lends itself to further exploration. Are these behaviours characteristic of all on-line interaction (e.g., e-mail and listservs) or are they specific to the educational context? Would these same questioning patterns be found in a face-to-face setting where class size and subject matter were comparable, or are they a product of text-based asynchronous interaction?

This study may provide some guidance for continuing research into the cognitive levels of questions and their impact on discussions in the technology-mediated environment. One of the greatest challenges in distance learning is to provide opportunities for interaction so as to actively engage the learners. Asking effective questions may be one of the best ways to meet this challenge.

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Summary and Conclusions

In this study, or compilation of studies, I explored the nature of the asynchronous interactions conducted within an on-line, post-secondary learning environment. Because interaction in the on-line environment is entirely lexical, that is, it takes place in the form of dialogue or conversation, albeit one expressed in a textual format, I chose to organise this study around elements of language. And, because language and its use is an inherently complex topic, I took a multiple perspective approach (Green & Harker, 1988) when designing the study, so as to examine as many facets of this interaction as possible within reasonable limits. So while the study is largely linguistic, I also considered cognitive functions and theories of teaching and learning. During the course of the study, I applied software interaction analysis, surface interaction analysis, cohesion analysis, speech act analysis, and discourse analysis, and also incorporated elements of content analysis and social network analysis. As I completed each section of the research, I drew conclusions based on the specific conceptual framework and research methods that I had used to examine the data. In this chapter, I will summarise some of the more notable points presented in the forgoing papers. I will also pull together some of the common threads and address features that I see as being defining characteristics of the interaction

conducted within this context and their implications, either for practice or for future research.

Summary

Participants in this asynchronous learning environment demonstrated a variety of strategies for communicating effectively within an that environment. There exist both quantitative and qualitative differences in the organisational, interactive, and content-related features of the instructor's and the learners' contributions. Their communicative adaptations ranged from the ways in which they maintained a cohesive and coherent discussion, to the linguistic structures they used to avoid direct confrontation. At the same time, there were characteristics of this on-line interaction that paralleled classroom interaction in the face-to-face environment.

The cohesiveness of participant interaction is key to asynchronous discourse. Some researchers have expressed concerns that the difficulty of following an asynchronous discussion stands in the way of effective communication (Bullen, 1998; Pincas, 1998; Winiecki, 1999), and "threaded" discussion software and structured subject lines have been deemed essential to support cohesive interaction (Levin, Kim & Riel, 1990; Pincas, 1998). I found no evidence to support this view, nor any justification for forcing a non-linear style of interaction into a linear format. Alternatively, I also found no evidence to support Hewitt's (1997) claim that the use of threaded software acted as a barrier to interaction. Based on both the extent and the cohesiveness of the interaction,

participants appeared to experience no difficulty in following the thread of a discussion or, for that matter, of several concurrent discussions. Their contributions were focussed on the topic at hand and exhibited neither the "conversation drift" (Hewitt, 1997) nor the "recency effect" (Graebner, 1988) that are said to interfere with productive discussion.

Cohesion

Although threaded conferencing software was the medium of interaction, not all participants chose to use software links (i.e., the reply function) to establish a cohesive discourse. Rather, they adapted the communicative strategies that are normally used in face-to-face conversations. For example, participants used such surface links as nominating—addressing other individuals by name, or adhesion—the use of quoted material to establish the context for the response or follow-up message (duBartell, 1995). The most common types of cohesive ties, however, were grammatical and lexical—the same references, substitutions, conjunctions, and reiterations that are used in oral communication. The combination of surface and lexical linkages provide explicit reinforcement to the narrative thread, while the linear reply function plays a supporting role within this non-linear communication context. As long as the software is unable to support simultaneous responses to multiple messages, participants will continue to rely on surface and lexical strategies.

Within a cohesive discourse, later contributions build upon and incorporate earlier ones. Contributions that do not receive a direct response may,

in fact, prove pivotal to the development of the discussion, or the "long conversation" (Maybin, 1994; Mercer, 1998). When participants develop and maintain a cohesive interaction, they create a context for learning. Within this context, each individual provides cognitive support to other participants, and learning is enhanced.

Characteristics of Participants' Speech

The wide variety of linguistic forms, such as speech acts and moves, that are used by participants in this on-line environment more closely resembles spoken than it does written discourse, which exhibits a much more limited range of linguistic functions (Harrison, 1998). Participants did, however, incorporate several elements common to written interaction into their discourse. These were primarily of an organisational nature and included such things as using titles to set off a portion of the message, or bullets or numbers to introduce new points. Participants were also careful to include complete citation information when referring to the work of others. This contrasts with the more casual types of acknowledgements (e.g., *According to Knowles, adult learners...*) used in face-to-face classrooms.

Participants tended to use a greater variety of interactive acts than would be observed in verbal interaction. These frequently served to replace visual, paralinguistic, or temporal cues. As was already mentioned, such strategies as nomination and adhesion were used to link new comments to those posted earlier in the discussion, whereas in face-to-face interaction, this might be accomplished

by making eye contact with the previous speaker. The same can be said for the recurrent use of greetings. Greetings also helped participants to establish and share a context with their audience. Empathetic acts such as thanks or apologies were common as were appeals for feedback.

The metalinguistic nature of some of the communication, while not unknown in oral communication, is common practice among participants in a text-based environment. Speakers do not generally comment on the grammatical structure of their contributions, for instance, but such comments are not unusual on-line. The same can be said about references to such things as spelling or the use of metaphors. While such utterances would interrupt the linear flow of face-to-face interaction (Stenström, 1994), they are not disruptive within the non-linear embedded interaction structure found in the asynchronous learning environment.

While the types of linguistic structures used in the on-line learning environment are similar to those observed within the face-to-face classroom (Sinclair & Brazil, 1983; Sinclair & Coulthard, 1975), there was a noticeable difference in who used some of the structures—the instructor or the students. The instructor was responsible for just over 11% of the speech acts and 16% of the moves, compared with the 73% that Hillman (1999) observed in post-secondary classes. Students not only contributed a greater proportion of the utterances, but they also used a much wider variety of acts and moves than they do in the face-to-face setting. Through the use of content-related acts, students provide not only most of the interactive moves, but they have also largely assumed the role of

information provider. The instructor was responsible for initiating the discussions and for evaluating the students' contributions.

This shift in structure was also reflected in the exchange patterns observed. Face-to-face classroom interaction is traditionally represented as a three-part exchange structure—*Initiate, Response, Follow-up*—with the instructor contributing both the first and last of the moves. In the on-line environment, students are more likely than the instructor to provide a follow-up response to other students. Even with students contributing the third move, most exchanges (58%) consisted of only two parts rather than three. The remainder ranged from three-part exchanges (generally involving a pair of students) to extended four-party exchanges. Three-part exchanges are also common in non-classroom exchanges. The third move is frequently conventionalized (Stenström, 1994), but its omission would probably be considered rude. In on-line interaction that third move is considered by many to be superfluous and in many instances inappropriate in that it contributes nothing of substance to the group discussion while at the same time contributing to information overload (Hiltz, 1985). Unlike face-to-face conversation where participants can engage in only one exchange at a time, in the asynchronous text-based environment there is no such constraint.

Moves that do not form part of an exchange are unusual in both classroom (Sinclair & Brazil, 1982) and out-of-classroom (Levinson, 1983) interaction. In verbal communication, if a move receives no response, the speaker will likely either repeat it or modify it until it is acknowledged. Unacknowledged moves are

not uncommon in on-line interaction, but within this context the lack of response does not necessarily mean that the utterance is in some way flawed or unintelligible. The content of these messages becomes part of the fabric of the ongoing discussion. Other participants may refer to what the speaker said, use vocabulary introduced by the speaker, or otherwise incorporate elements of the message into their own contributions.

Questions and Cognition

One of the speech acts most frequently observed in classroom interaction is the question. The questions observed in this on-line environment drew on a slightly narrower range of syntactic forms than do questions asked in face-to-face interaction, but at the same time, they exhibited higher levels of cognitive functioning. This was true of both the instructor's and the students' questions. Within the face-to-face classroom, instructors' questions were used primarily to organise class activity, to focus student's attention or to check comprehension (Barnes, 1983). Organisational questions are not usually cognitively challenging. The types of questions that are used most often for the purpose of focussing or checking comprehension are Cognitive-Memory questions. They are also likely to be display questions, to which the instructor knows the answer. Barnes found that in the classroom, 80% of the instructors' questions required little thought on the part of the students. In the on-line learning environment, only 10% of the instructor's questions could be classified as display questions, and very few called

for either Cognitive-Memory (13%) or Routine Thinking (12%). Most of the instructor's questions were used to initiate discussions.

Students asked most of the questions (77%), and 65% of these were at higher cognitive levels. Questions at the lower levels were largely in the nature of requests for feedback from other participants, and resembled face-to-face conversations. Students did not ask display questions, which is consistent with face-to-face classroom interaction (Markee, 1995). They also contributed seven of the eight transpersonal questions.

The cognitive level of questions is a more important factor in stimulating interaction than is syntactic form. Routine Thinking and Cognitive-Memory questions received responses but did not result in interaction. Nor did Convergent Thinking questions; these were usually asked near the conclusion of a discussion and served as a means of wrapping it up. Divergent Thinking questions did lead to extended discussions, but Evaluative Thinking questions stimulated the highest levels of interaction. Most of the Evaluative Thinking questions took the Yes/No syntactic form; the resulting interaction contradicts the view that Yes/No questions either stifle discussion or lead to minimal responses (Dillon, 1994; Hunkins, 1995).

Students were more likely than the instructor to ask rhetorical questions — 96% compared to 4%. These questions share the following characteristics: they appear as a string of questions, they contain such phrases as "I wonder" and "what if," and they were frequently answered by the person who asked the question.

Rhetorical questions were used in three distinct ways. In the first, the writer used rhetorical questions in an attempt to persuade the reader; the questions were used to establish and reinforce the writer's position. The questions contained in these long, formally structured "speeches" did not stimulate any interaction and the messages themselves received only the occasional acknowledgement. In contrast, the second use of rhetorical questions acted as a catalyst for interaction although they did not necessarily receive a direct reply. These questions could be compared to "thinking aloud." With their informal tone and element of self-disclosure and reflection, these questions often introduced new ideas and explicitly invited further comments or differing viewpoints. The third use of these questions was to provide a means for one participant to express their disagreement with another's position without confronting them directly. In this case, a participant's reply to an earlier message would comprise a series of rhetorical questions. This might precipitate a similar response, that is, a message containing another list of rhetorical questions. This process could be repeated several times. In this manner, opposing viewpoints could be expressed, and the discussion could proceed even when reaching a consensus was unlikely. On those occasions when one of the participants requested input from other members of the group, these questions could stimulate interaction.

Implications for practice

Although asynchronous communication has been credited with removing control of the discussion from the instructor and facilitating a more learner-

centred type of interaction (Murphy, et al., 1996), creating an environment that is conducive to learning remains the responsibility of the instructor. Many factors over which the instructor has influence can have an impact on both the extent of the interaction and the cognitive level of that interaction. These include creating a context for interaction, establishing and modelling the desired standards of discourse, and moderating the process.

Creating the context

Just as is the case in face-to-face classrooms, one of the instructor's roles continues to be establishing a context for interaction. Creating that context goes beyond unlocking a door to a classroom or creating an on-line conference. Within the on-line environment, information overload can interfere with effective learning (Hiltz, 1985; Murphy et al., 1996), but the issues of quantity and quality of on-line interaction are not easily separable. As Newman, Johnson, Cochrane and Webb (1996) observed, there exists an inverse correlation between the number of messages participants were required to assimilate and the level of critical thinking exhibited in the on-line interaction. My research confirmed these findings. The volume of messages posted to on-line discussions can affect the quality of interaction that takes place. If participants do not have to deal with an overwhelming quantity of messages, they are better able to follow and contribute to a cohesive interaction. The use of sub-conferences to facilitate small-group discussions provides participants with an opportunity to engage in topic-specific discussions, and also reduces any tendency toward conversation drift (Hewitt,

1997). This strategy could be effective in situations where information overload is a concern, such as when the class size is very large, or if the time frame is relatively short.

This is not to suggest, however, that a smaller volume of messages will automatically lead to higher-level thinking. For example, the instructor's Cognitive-Memory questions always elicited a response—the right answer—but once that answer was provided, no further discussion ensued. In such situations, both the volume of messages and the level of cognitive function were low. The discussion initiator must be both stimulating and challenging and introduced in such a way that participants are left in no doubt as to what is expected of them.

Establishing standards of discourse

The instructor's initial message to each new discussion group not only organises the ensuing discussion, but also sets the cognitive tone for what follows. The initial posting is central to the discussion in that virtually all of the subsequent messages posted to that group will link to the initial message in one way or another. And because the cognitive level of the instructor's questions is reflected in the students' responses to those questions, it is evident that the instructor's role in establishing standards of discourse is pivotal.

Since some students clearly prefer to respond to and interact with the instructor rather than with other learners, the instructor should take this into consideration when establishing expectations. In small group settings, when one participant contributes only minimally, it can have an impact on the total group

interaction. Instructors might want to consider limiting the number of Cognitive-Memory questions they ask in favour of the higher level Divergent Thinking and Evaluative Thinking questions that provide more scope for discussion. In instances where participants can select from several discussion topics, minimizing the number from which they can choose may help to stimulate interaction. Finally, in an environment where participants have been socialised to learn independently, it may be necessary to explicitly state your expectations regarding participant interaction. Asking them to "discuss" a topic may not be sufficient, since students' interpretations of such directions may differ. For example, it is very likely that some will respond as they would to such directions on a written examination by submitting an essay rather than engaging in conversation.

Moderating the process

While one of the greatest barriers to attaining higher cognitive levels in classroom discussions is the limited amount of time students have in which to process their ideas (Hunkins, 1995), the lack of constraints on processing time is one of the advantages of working in an asynchronous environment. Since an immediate response is not required, participants can take whatever time they need to consider the question, the responses put forward by other participants, and their own views. Even without factoring in this extra processing time, asynchronous communication takes longer than does face-to-face interaction. It is counterproductive to allocate less than a week to discuss a topic in any depth. Although most discussions were scheduled to take place over a period of four

days, the average duration was 6.5 days with a range of from five to nine days. The students disregarded the discussion schedule and chose to extend each discussion, even though it meant that they would have to contribute to more than one discussion at a time. While this should be considered when creating the learning context, it can also be a factor when moderating the discussion process.

Although the natural duration of a discussion was approximately one week, there were instances where the discussion began to flag after a few days. If the instructor asked a probing question at that point, the interaction gained momentum and continued for several more days. In those discussions that maintained their momentum for the full week, however, a probing question asked at the end of that time did not stimulate interaction in the same way. One likely reason for this is that by then, participants were beginning to contribute to two new discussions. There is no reason that a discussion should be limited to one week if an instructor is prepared to challenge participants with new concepts or questions and encourage them to expand upon their ideas, and if sufficient time is built into the schedule. One final consideration pertains to the use of probing questions; they can be very successful at stimulating interaction when asked of the group, but when they are directed to an individual the result is a brief two-party conversation.

While asking probing questions is one way to moderate the learning process, there are other practices that encourage learners to use higher order thinking skills. As mentioned earlier, there is a perception that participants in the

on-line learning environment find it difficult to follow non-linear discussions, and in order to compensate for this, instructors should engage in frequent weaving or summarising of ongoing discussions (Berge, 1995; Collins & Berge, 1996). It is not uncommon, however, for students to respond to several previous postings within one message, thus filling the role of "weaver" by pulling ideas together. These students' summaries compiled earlier contributions by quoting excerpts from them and identifying the original contributor. The instructor, on the other hand, presented a synthesis of earlier contributions, reformulated rather than quoted material, and only rarely identified the contributors. This replicates face-to-face classroom where such activities demonstrate the instructor's cognitive level, rather than that of the students (Barnes, 1983; Mercer, 1998).

Perhaps it is time to reconsider whether this weaving process is effective and to suggest some alternatives. Since participants do not, in fact, appear to experience any difficulties in either following the discussion or maintaining cohesion, that argument does not provide sufficient rationale for the practice of weaving. Rather than asking for a summary of the discussion, instructors might consider asking students to identify key themes arising from the discussion and perhaps to reach a consensus with regard to the relative importance of those themes. Depending upon the context or the content of the discussion, it may be more meaningful to ask participants to identify potential "next steps" based on the discussion to that point, or in other instances, the implications of implementing their recommendations. Alternatively, students could be asked to identify the most

important questions arising from the discussion. These types of activities are more likely to stimulate divergent thinking or evaluative thinking than would weaving activities that most frequently demonstrate Routine Thinking.

One concern that arises when students post cognitively complex messages is that critical points may be overlooked. While it is not necessary to follow-up on every point made in each message, those that have the potential to move the discussion in significant new directions should not be allowed to pass unnoticed. Rather than summarising discussions, the instructor could reintroduce these points at appropriate times, for example when the discussion shows signs of exhaustion or if the group has reached consensus too readily. This would entail far less effort on the part of the instructor than would be needed to synthesise a large volume of student contributions. It would not only advance the discussion, but it would also provide a signal to students that the instructor is 'present' in the interaction even though they may not be actively posting messages.

A summary of suggestions for instructors can be found in Appendix C. These suggestions include recommendations for designing, moderating and assessing on-line interaction.

Implications for research

The implications for research that arise from this study relate to either methodological challenges or directions for future exploration. As noted previously, I took a multiple perspective approach (Green & Harker, 1988) and used a number of different analytical methods in this study. The greatest

challenge to implementing this approach is the degree to which it taxes the resources of the researcher. Most of the methods that I used were variations of content analysis, which has been described as being demanding to the extent that few use it on more than one occasion (Rourke, Anderson, Garrison and Archer, 2001). As a non-participant observer, I followed the interaction, or the long conversation, as it unfolded. Because I shared the context, I was able to share the sense of immediacy experienced by the participants—a sense of immediacy that is lacking when transcripts are read by transcribers, coders, and analysts after the discussion has concluded. At that time, I maintained a journal of my impressions of the interaction, noting when the discussion was intense, when it lagged, and what events were taking place concurrently that might be affecting the discussion. Although demanding, it was that approach that provided the most comprehensive information, so its use is certainly justified. No single method was able to provide a complete picture of this interaction, so it is only reasonable to expect that some combination of methods would be more representative of a complex phenomenon (Nunn, 1996).

While I have attempted to present a comprehensive description of the communicative interaction that took place within a specific context, I see several potential avenues for future research. Although I have compared the on-line interaction of this graduate level class with that of face-to-face classroom interaction as it is described in the literature, it is possible that the differences may not be as great as they appear. An analysis of similar face-to-face graduate

classes (based on class size, subject matter, etc.) could provide valuable information upon which to base a comparison and to determine if the higher levels of cognitive processing are typical of a particular type of postsecondary environment or if they are a product of text-based asynchronous interaction.

What I have described in this study is the interaction that developed naturally throughout the course. A second area of exploration that might provide useful information to practitioners would be to observe the impact of various instructional strategies on both participation and cognition within a more controlled setting. For example, the outcomes of different questioning techniques could be compared for their ability to elicit higher order thinking. This type of research is not uncommon within the traditional K-12 environment (Hunkins, 1995), however, it is quite unusual at the post-secondary level (Fischer & Grant, 1983; Graesser & Person, 1994) and virtually non-existent within the on-line environment (Muilenburg & Berge, 2000).

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Appendix A:

Discourse Analysis

Schools of Thought

The field of discourse analysis can be subdivided into four different schools. Discourse analysis as practised by proponents of one school is quite different from discourse analysis as practised by those in another.

Text linguistics

- The first type of discourse analysis, text linguistics, is interested primarily in **written language**.
- It places less emphasis on the context and more on the relationships between the sentences that make up the exchange.
- **Cohesion**, the 'surface' marking of the semantic relations between elements and **coherence**, the 'deep' underlying logical and rhetorical relations between the elements, are the two main areas of analysis in this type of study (Halliday, 1994).
- Proponents of this school tend to have a **traditional linguistics** perspective.

Conversational analysis

- American discourse analysis, or conversation analysis, looks at oral narrative (Labov, 1972) and the **organization of discourse**.
- The emphasis here is on the behaviour of participants in talk and includes the **speech patterns** and **informal discourse markers** that are used in different cultural and social settings (Gumperz, 1982; Hymes, 1974).
- This encompasses the **conversational rules** and the procedures that

participants use for managing interaction (Grice, 1975).

- Both small and large-scale units of management are of interest to conversational analysts.
  - The basic unit of management is the **adjacency pair.** This comprises any pair of utterances where the second is constrained by the first, as is the case with questions and answers or greetings and responses (Sudnow, 1972; Tannen, 1990).
  - **Larger scale units** of management consist of such speech events as opening or closing a conversation (Sacks, Schegloff & Jefferson, 1974). These include non-verbal speech components such as kinesics and proxemics (Hall, 1963).
- Proponents of this school tend to have an **anthropological** orientation.

Social functional analysis

- British discourse analysis, with its social functional view, places its emphasis on **models of structure**.
- Analysts with this focus are concerned with **situational constraints** (Halliday, 1978) such as:
  - field (purpose of communication),
  - tenor (relationships among participants), and
  - mode (channels of communication)
- **Speech act theories** (Austin, 1962; Bellack et al., 1966; Searle, 1969;

Sinclair & Coulthard, 1975) form the basis of this approach:

- locutionary acts (constatives: utterances that convey information)
- illocutionary acts (performatives: acts that are performed by an utterance)

  Performatives include: Representatives, Directives, Commisives, Declarations, and Expressives (Austin, 1962).
- perlocutionary acts (acts that occur as a result of an utterance).

- The **units of analysis** in this perspective include:
  - Transactions
  - Exchanges
  - Turns
  - Moves
  - Acts (Stenström, 1994)
- Research in this type of discourse analysis is very concerned with **context** and has been conducted in a variety of settings, for example in educational, medical, or legal environments (Sinclair & Coulthard, 1975; Stubbs, 1983)
- Proponents of this school often present a **sociological** view.

Critical discourse analysis

- The fourth type, critical discourse analysis, includes an ideological component. In fact, the study of the **ideology** as it is organized within speech is the key characteristic of critical discourse analysis.
- Ideology is manifest not only in the form of "powerful talk" but also in the

way power is talked about.

- This orientation draws upon linguistics, as well as upon philosophy, rhetoric, and social psychology.
- The context of this research, whatever its social, temporal or proximal nature, is always **political** (Wetherell & Potter, 1992; Wodak, 1984; van Djik 1985).
- Proponents of this school are primarily concerned with **critical theory**.

Common features

In spite of the fact that I have presented the four types of discourse analysis as discrete categories, they are not really so clearly delineated. They overlap to varying degrees and in different combinations and permutations. In spite of the subtle and not so subtle differences, all four share one common factor. Discourse analysis is concerned with what people *do* with language as a form of social action and interaction.

Discourse analysis or analysis of discourse

Although these terms are used interchangeably, and although I have not found this issue addressed directly in the literature, I think that a distinction can and should be made between discourse analysis and analysis of discourse. "Discourse analysis" as outlined in the previous section refers to the theoretical perspectives of all four schools of discourse analysis and is the broader of the terms. "Analysis of discourse" applies primarily to the work done by critical discourse analysts and

is concerned with issues of power and control (Poster, 1990). The analysis of discourses can take either of two approaches.

- The first is a deconstructionist approach that attempts to reveal internal contradictions often hidden by linguistic devices (for example, using the passive voice to "hide" the actors). What is not said becomes as important as what is explicitly stated (Derrida, 1990).
- The second takes a more historical, or genealogical, approach (Foucault, 1973) and attempts first to identify the "truth" expressed in a discourse, and then determine how that truth came to be accepted and how it is maintained by the existing power structure through discourse.

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Appendix B:
Definition of Terms

Act (speech):

The smallest communicative unit, and the lowest rank in the hierarchy.

Anaphoric reference:

Refers to something previously mentioned.

Asynchronous:

Independent of time and place, asynchronous communication does not require the participants to be involved in the exchange at the same moment.

Backchannel:

Signals the listeners attention—may be verbal or nonverbal.

Cohesive:

What is said is linguistically linked.

Computer-mediated communication:

Uses computer systems to facilitate the transfer, storage and retrieval of information. Three broad categories of CMC are computer assisted instruction (CAI), informatics, and conferencing (synchronous and asynchronous.

Computer conferencing:

A computer messaging system that allows participants to communicate on a one-to-one, one-to-many, or many-to-many basis.

Comment:

These messages refer to a previously posted message or contribution and may be arranged in either chronological order or according to threads.

Contribution:

These messages are not linked to a previous message.

Discourse analysis:

Based on speech act theory, discourse analysis assumes that all utterances can be categorised and that there is a finite set of identifiable functions that utterances can perform.

Exchange:

The smallest interactive unit, it requires the participation of two speakers, each making at least one move.

Grammatical items:

Function words: determiners, pronouns, most prepositions, conjunctions, etc.

Interactive written discourse:

An emergent discourse genre.

Lexical density:

The ratio of the number of lexical items to grammatical items in a sentence or clause.

Lexical items:

These words are content words. They contain most of the information in an utterance.

Listserv:

An Internet-based subscription list.

Move:

The second-lowest hierarchical level, it may comprise one or more acts.

Phatic:

Language used to establish or maintain a social relationship rather than to convey information.

Register:

This refers to the 'tone' or degree of formality used in communicating.

Sociolinguistics:

The relationship between linguistic forms (lexicons, rules of grammar) and their social uses. Sociolinguistics stresses the social practice of language.

Synchronous:

Occurring in 'real-time', synchronous communication requires that participants be involved in the exchange at the same time although not necessarily in the same place.

Thread:

A series of messages which have the same subject heading, a thread may contain as few as two postings (a contribution plus a comment) or an unlimited number of postings (a contribution, comments on the contribution, comments on other comments, etc.).

Transaction:

This comprises one or more exchanges, all on the same topic.

Turn:

Everything a speaker says before relinquishing the floor to the next speaker.